ELECTRICAL REVIEW

• Mazda •

• lamps •

• stay • brighter

• longer •

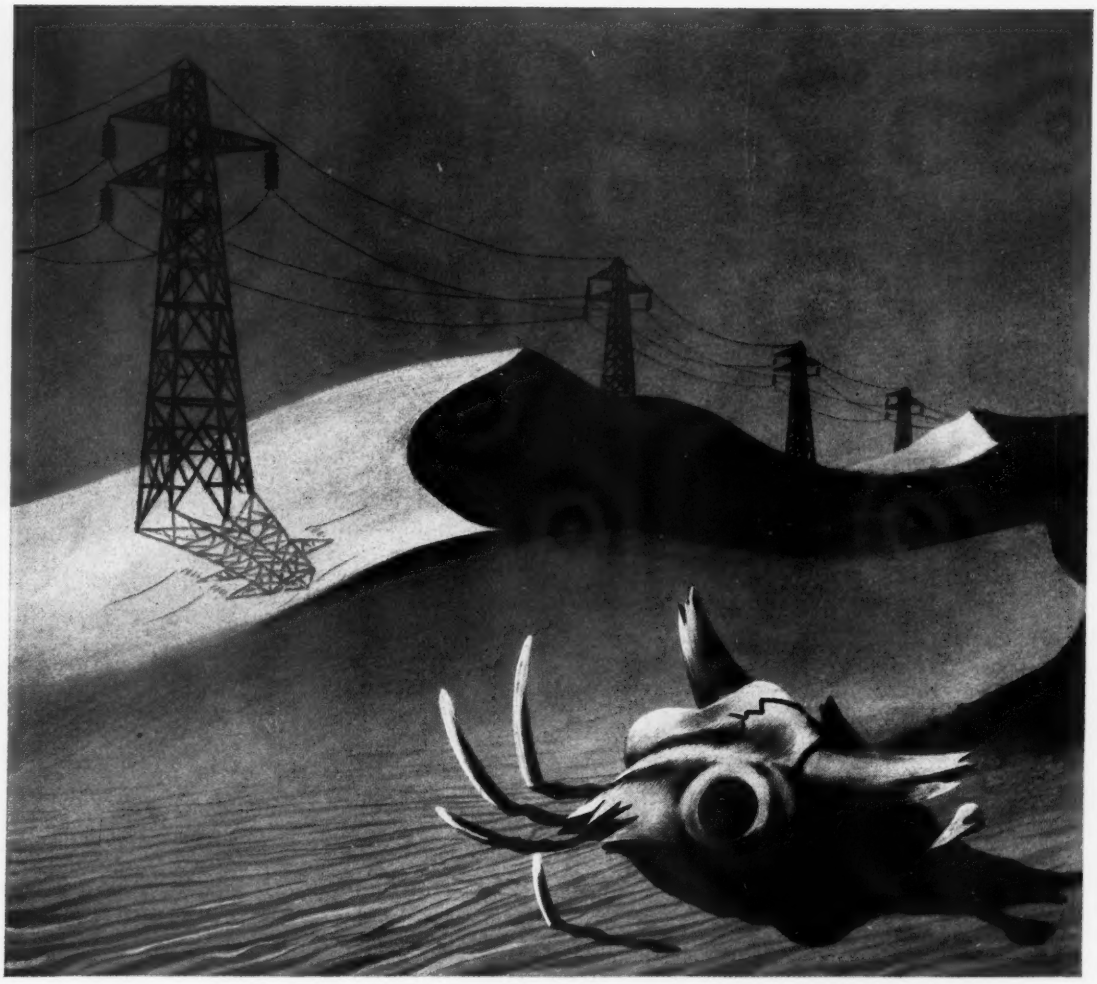
The A.S.E.E. Exhibition, Earls Court
March 20th—24th
Stand No. H.20

4571A

The British Thomson-Houston Company Ltd., Crown House, Aldwych, London W.C.2.
(Member of the A.E.I. Group of Companies)

B T-H

The Painter's View



Desert Highway

THE sun-baked desert is a long way from our works at Hereford, but in far-away places, from Basra to Brazil, you will find Painter Brothers' towers standing untroubled either by extremes of temperature or of humidity, because we are specialists and understand these problems.

Because we have always been Tower Specialists and have developed our own fabrication methods which ensure accuracy and interchangeability; because we have had nearly thirty years' experience of hot dip galvanising, and because we have our own Tower Testing Station to prove the behaviour of structures under every sort of loading condition, Painter Brothers' towers are Towers of Strength.

Painter Bros. Ltd.

HEREFORD

Overhead Electrical Transmission Towers and Poles; Radio Masts; Callender-Hamilton Bridges.

ELECTRICAL REVIEW

Managing Editor: HUGH S. POCOCK, M.I.E.E.
General Editor: J. H. COSENS
Technical Editor: P. W. TUCKER, M.I.E.E.

9 MARCH 1956

In This Issue

351 RESHAPING THE LOAD CURVE
353 LOAD CURVE ANALYSIS
357 SCOTTISH WATER POWER
359 MESSINA CROSSING
361 LETTERS TO THE EDITOR
362 NEW BOOKS
363 BATTI-WALLAHS' SOCIETY
365 PARLIAMENTARY REPORT
367 NEW ELECTRICAL EQUIPMENT
368 COST OF RURAL ELECTRICITY
369 VIEWS ON THE NEWS
370 TECHNICAL EDUCATION
371 PERSONAL AND SOCIAL
374 FINANCIAL SECTION
377 INDUSTRIAL NEWS
380 GENERATION AND DEVELOPMENT
381 NEXT WEEK'S EVENTS
382 CONTRACT INFORMATION

109 *CLASSIFIED ADVERTISEMENTS*
122 *INDEX TO ADVERTISERS*

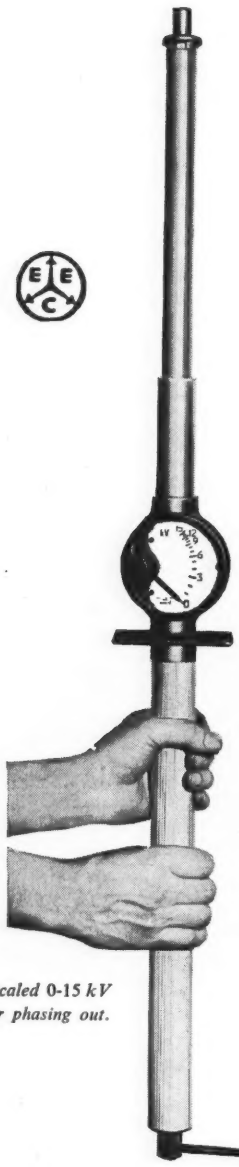
VOLUME 158 ✧ NUMBER 10

Eighty-Fourth Year of Publication

FRIDAY ✧ PRICE 1s 6d

Editorial, Advertising and Publishing Offices: Dorset House, Stamford Street, London, S.E.1. Telegraphic Address: "Elecrev, Sedist, London." Code: ABC. Telephone No. Waterloo 3333 (60 lines). Registered at the General Post Office as a Newspaper. Entered as Second Class Matter at the New York, U.S.A., Post Office. Annual Subscription: Home and Overseas £4 10s 0d: U.S.A. and Canada $14.00. Cheques and Postal Orders (on Chief Office, London) payable to ELECTRICAL REVIEW PUBLICATIONS LTD., and crossed "Lloyds Bank."

DOUBLY CHECKED FOR SAFETY...



11 kV Model. Scaled 0-15 kV with provision for phasing out.

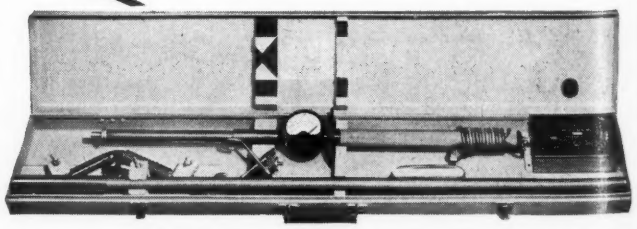
LIVE CONDUCTOR TESTER

The new model provides for separate proving tests of the resistance rod and of the indicator movement itself in all circumstances. The operator can thus check the tester before and after use and confirm the indication.

NEW FITTINGS AND MODIFICATIONS

- **Provision for phasing out on all models up to 33 kV.**
- **High voltage proving unit to check continuity.**
- **Low voltage proving unit to check indicator movement.**
- **Extension rod for overhead lines.**
- **Special contact ends for different types of gear.**
- **Aluminium carrying case with fittings.**

High resistance pattern.
Continuous circuit to earth.
Fully insulated construction.
Ample clearance for operator.
Balanced construction for easy handling.
New edition of Cat. Sheet 254A gives full details. Available on request.



11 kV model in carrying case complete with: extension rod and hook contact for overhead line; bent end adaptor and ball end contact for metalclad and cubicle switchgear; proving unit and phasing lead.

EVERETT EDGCUMBE

Designers and Manufacturers of almost every type of electrical indicating and recording instrument. Specialists in: Speed Recording, Photometry, Process Time Control, Telemetering.

COLINDALE WORKS LONDON N.W.9 TELEPHONE: COLINDALE 6045

DHB/2304

ELECTRICAL REVIEW

9 March 1956 Vol. 158 No. 10 Established 1872

Reshaping the Load Curve

THE article in this issue on " Load Curve Analysis " by Messrs. Jesty and Stewart shows how valuable the load curve can be for quickly extracting information relating to the loading conditions on an electricity supply system, and it outlines some of the methods by which legitimate approximations and inferences are made for the benefit of those who are concerned with operations and maintenance in the industry.

The correct interpretation of load curves and diversity factors is seen increasingly to be of considerable importance in contributing to the economic and efficient operation of a supply unit, be it District, Sub-Area, Board, bulk supply provider, or private plant.

We have progressed far beyond the era of getting the country electricity-minded. Now that a supply of electricity is considered a necessity the problem is to handle in the most economic manner the widely different types of demand that are made on our supply capacity.

In the aggregate, these demands produce to a greater or lesser extent, depending on the nature of the area served, embarrassing peaks which it behoves the planning engineer to control or to level out if he is to frame a rational plant installation and maintenance programme and if it is hoped to devise an equitable tariff structure in which each consumer contributes his fair share to the expenses of the undertaking. Restriction of supplies to lop off peaks has, unfortunately, had to be adopted as an economic necessity during the post-war years of shortage of generating plant, but this cannot be justified in times of adequate plant capacity. The alternative to the planner is to raise the level of the basic load so that the disparity between maximum and minimum loads is reduced and the plant utilisation factor correspondingly increased.

To achieve this end he must be fully appraised of the nature of the individual loads for which he is catering. Ideally, he should know in any given circumstances how much each type of consumer is contributing to the demand on the undertaking.

It is the search for this information that has fostered the growing interest in load-curve analysis. Since the war the wider appreciation of statistical techniques has prompted engineers from many countries to prepare papers on the subject and at the 10th Congress of UNIPEDE held last year in London it was recommended that a permanent sub-committee should be set up to study the problem further.

In paragraph 250, the recent report of the Herbert Committee on the Supply Industry gives added endorsement, if any were needed, to the importance of this aspect of the industry's work, and in Chapter 16 the report refers to the Utilisation Research Committee, which consists of representatives of Area Boards under the chairmanship of one of the Central Electricity Authority's deputy commercial managers.

The very nature of the problem is such that it must be under constant review for, if the research and analysis involved are to be of real value to the planners, the basic data must always be in step with current behaviour and electricity utilisation practices.

ELECTRICAL ENGINEERING AND HIGHER PRODUCTION

The Duke of Edinburgh has time and time again in his speeches put his finger on some truism which is so simple in character that its significance is lost for a while. Such was the case a few years ago when, as president of the British Association, he drew attention to the extreme seriousness of the position in this country in respect of the shortage of technologists. Now the alarm is being sounded in all quarters—professional, educational, political and industrial.

At the annual dinner of the Institution of Electrical Engineers His Royal Highness " touched the button " again when he said the electrical engineering industry was helping the economy of the country by making it possible for all other industries to increase their productivity. Here we have a point which is not, we are sure, fully appreciated, let alone exploited, by the electrical industry as a whole. There is, indeed, hardly a piece of electrical equipment which has not been responsible for a considerable increase in production in both electrical and non-electrical industries.

As we have said before, the call for increasing production still goes on and we believe it will continue to be met by still further improvements in electrification with a still greater employment of electrical control. It is of the greatest possible importance that these things should be fully known throughout the electrical industry, because such knowledge itself spells further increases in production.

SICILY - ITALY LINK

In this issue we publish an account of the lecture recently delivered to the Institution of Electrical Engineers by Signor F. Bianchi describing the construction of the transmission line across the Strait of Messina, the successful accomplishment of which was a remarkable achievement. Although there are reports of a longer link across a Norwegian fjord, as was pointed out, the relatively steep sides of such a place and the shipping traffic make the task much less difficult than the crossing of the Messina Strait.

The first cable link was carried away by a ship which ignored the official closing of the Strait and innumerable signals of all kinds, even men waving arms. In erecting the cross-arms, one of which was 80 yards across, we are told that the contractors approached the matter in a " light-hearted " manner, treating it as a normal transmission tower. They seem, however, to have had many qualms before the job was completed. There can be no doubt but that the Italian engineers concerned deserve our commendation for a very fine piece of construction work.

TECHNICAL EDUCATION WHITE PAPER

We outline in this issue the contents of the White Paper which gives details of the Government's new five-year plan for technical education. Rather than anything really new the Paper seems to us to marshall the various ideas that have been put forward in the last few years in Government memoranda, notes and other official documents and, better still, it seems to co-ordinate various schemes put forward by the professional bodies, industry, educational authorities and the Government. After reading the Paper we were left with the impression that the educational programme was measured solely in terms of the capital cost involved; that such an impression should be given is a great mistake. It is pleasing to see that broader aspects of education, such as the arts, are not to be ignored by the new plan. This will be welcomed by the very many industrialists who have had it brought home to them of late that the best technologist is the man who can take a wider view of what is going on outside his own particular sphere.

The White Paper rather gives the impression that there is something novel in the sandwich course, but many engineers well remember the courses arranged by local colleges and some of the larger and old-established firms, and all concerned will do well to draw on the experience of those successful sandwich courses which have been running for so many years. We believe that the electrical industry can take very high credit in this excellent early work. We feel that the White Paper has done very good work in clarifying this matter and it helps to remove confusion which has existed in recent times over the new award established by the National Council for Technological Awards.

SCOTLAND'S PROBLEM

Since its inception the North of Scotland Hydro-Electric Board has built up a great asset for the Highlands in the score or more water power stations which it has constructed. These, with their low cost of production, have enabled the Board to supply electricity to a large part of its sparsely populated area at very reasonable rates. Unfortunately, as last year's experience showed, the Board's finances are very sensitive to outside influences. Because of the prolonged drought the output of the hydro-electric stations was 343 million kWh less than in 1954 and over a million pounds was thereby added to the Board's costs. Moreover, the construction of new schemes is becoming steadily more expensive, and longer lines are required to reach new consumers, who live mainly in the more isolated parts of the area.

Speaking of this problem in Glasgow last week, Mr. Thomas Johnson, the Board's chairman, emphasised the importance of providing proper amenities to encourage people to live on the land. The outlying consumer, he said, obviously could not afford to pay £1,500 a mile to connect his premises and in view of the need to increase agricultural productivity he felt that it was up to the Government to consider how far it would pay the nation to make grants-in-aid to distant, rural consumers.

ELECTRICAL ENGINEERS EXHIBITION

Next week's *Electrical Review* will contain an illustrated stand-by-stand preview of the Electrical Engineers (A.S.E.E.) Exhibition which is being held at Earls Court, London, from Tuesday to Saturday, 20th to 24th March.

Load Curve Analysis

THE MAKE UP OF MAXIMUM DEMAND

By

E. H. JESTY, A.M.I.E.E., M.Soc.C.E.(France)

and J. L. STEWART, B.A., F.S.S.*

IN the general sense "load" curves are understood to mean "demand" curves showing the maximum demands on an undertaking or piece of equipment at fixed intervals over a given period of time. A "load" curve is as much a bare statement of facts as the tabulated data from which it is compiled. It has the advantage, however, that much information which is concealed and unrecognizable in the tabulated form is brought to light visually when the data are plotted. The two forms of presentation are complementary: the curve indicates at a glance the salient features of the information and suggests profitable lines of inquiry which, to be fully developed in the quantitative sense, must make use of the tabulated data.

Some aspects of social behaviour which might be expected, but which, without a study of the load curves, might easily be overlooked, become evident from analysis. A broadcast relay of a prize fight taking place in the United States in the evening has provided unexpected and possibly embarrassing peak demands in a European country in the early hours, when normally the load would be very light. The effect can be prolonged into the more heavily loaded hours by repeated relays, later in the day, of recorded commentaries and might conceivably affect the payable maximum demand in a most uneconomic manner.(1)

Astute observation of the curves can yield information about an enterprise which it would be difficult, if not impossible, to derive from the tabulated data alone, information which is invaluable to both technical planning and administrative management. The late Lord Bryce once said "For Heaven's sake give us the facts: we can all do the theorizing for ourselves." This is undoubtedly true but the basis of the theorizing is likely to be the sounder if its pattern follows the teachings of experience.

For the proper appraisal of an undertaking, with its achievements and probable development, curves are required of the variations in the magnitudes of the various quantities which may be loosely designated as "load": e.g., maximum demand, kWh, load factor, etc. These curves must be in respect of a period long enough to ensure that unwarranted conclusions are not drawn because of the influences of seasonal or temporary fluctuations. From this point of view the nationalization of the supply industry was a mixed blessing, for whilst it has undoubtedly made the accumulation of comprehensive data in respect of the larger units easier and more consistent, the wholesale amputation of supply areas, their re-agglomeration into new units and the redistribution of loads to achieve a balanced economy of operation has meant that much information relating to the new operating units before 1948 does not exist and for some older undertakings does not go back, consistently, as far as that. Until now, therefore, the series available for analysis have been shorter than is desirable for statistical reliability.

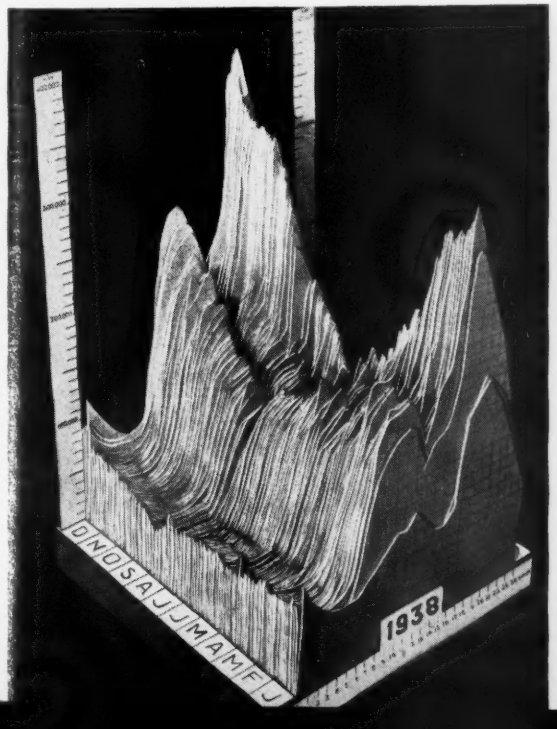
A useful device, long established in the supply industry, consists in building a three-dimensional model of the load diagram by pasting the cut-out curves of the loads throughout the 24 hours, for the 365 days of the year, on to stout card backings and stacking them in a frame having a three-dimensional scale, of hours and months horizontally and kW vertically.

Illustrations of two such models (Figs. 1 and 2) are reproduced by permission of Ch. Béranger, from the book "L'Electricité à Paris," by Charles Malégarie.(2) A quick glance at these "montagnes de charge" enables a vast amount of analysis to be made visually quite quickly, with very little effort, and reveals the differences in magnitude and times of peaks between 1938 and 1945.

Certain other points of analysis emerge at a glance: in Fig. 1, the relapse from summer time to normal time, on

*The authors are with the London Electricity Board.

Figs. 1 and 2.—Three-dimensional load diagrams for Paris in 1938 and 1945



2nd October at 0 hours, is seen to be responsible for an increase in load over the previous day of 40 MW and the time of the peak has advanced by one hour.

The disadvantage of solid curves is their bulk. They are by no means easy to store. For this reason contour diagrams are sometimes preferred. These are, in effect, modified plans of the solid curve the horizontal hours and months axes of which are drawn on the flat while the third dimension is represented by coloured or hatched strata. The results of entries in this form appear as contour maps of mountain ranges separated by more or less parallel valleys from subsidiary ranges depicting respectively the main and secondary daily peak loads. In fact, much of the clarity and detail of the solid curve is lost by translation into the contour diagram form owing to the limited number of strata which can be successfully differentiated by colour. It is doubtful whether more than six colours, and even fewer hatching patterns, can be used without necessitating constant reference to the colour code and in an undertaking having a maximum demand of, say, 1,500 MW or more, each stratum would therefore have to be around 250 MW. It might therefore so happen that a jump of 240 MW in the load was concealed in a single colour whereas an increase of 2 MW at the limit of a particular stratum was picked out by a change of colour.

The main preoccupation of engineers is the maximum demand and the constant concern of the commercial branch is the energy sold. When the two are plotted on the same graph, bearing in mind the relative significance of the chosen scales, information on the probability of future load factors emerges (Fig. 3). Whilst load factor is, to a very large extent, outside the control of the undertaking, it is a useful parameter for those concerned with load development planning.

In the London Area it will be necessary to sell 3,550 kWh for every 1 kW of on-peak maximum demand if the present load factor of 40·4 per cent is to be maintained, and more than this amount of energy per on-peak kW if the load factor is to be improved.

Public lighting is sometimes debited with the disadvantage of being "on-peak" load and thus likely to have an adverse effect on load factor. Load curve analysis shows, however, that in London 1 kW of public lighting, in all-night lighting hours, consumes some 3,900 kWh and redeems its position from the aspect of desirable load development, in the present circumstances.

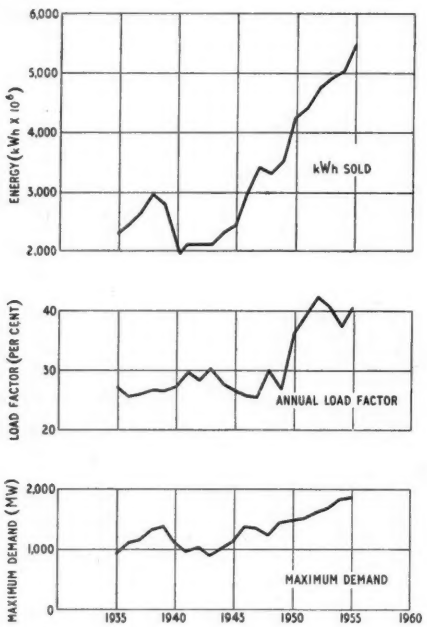


Fig. 3.—The vital statistics

Demand and Temperature

The sort of correlation which exists between temperatures and maximum demand is shown in Fig. 4. This shows the demands and average temperatures on week-days in 1950-51 and 1951-52 in a large city with extensive built-up suburbs. The hatched areas indicate when temperatures were lower in 1951-52 than in the preceding year and when the maximum demands in 1951-52 were higher than in 1950-51. Only the demands in the months of November to February have been plotted and only the week-day demands since the summated maximum demand in any year in the instance considered always falls on a week-day in these months.

It is worth emphasizing that the temperatures shown are average daily temperatures. There is a fairly well defined time-lag in the correlation of load and temperature, with load following sluggishly in the wake of temperature so that the correlation between demand and the temperature at the time of the demand is relatively low. The effective temperature used in the Central Electricity Authority's calculations is the mean of the four hours preceding the demand period and of the corresponding four hours of the previous day. For practical purposes average temperature of the day of the demand or a weighted average of the maximum and minimum temperatures of the day gives quite a high correlation.

So far we have considered "demand" as a comfortingly robust foundation on which to base our theorizing, yet the demand on which engineering policy and considerations are based and for which the consumer ultimately has to pay—the maximum demand and in particular the annual m.d.—is by its very existence something of an aberration. It is the extreme case. A cold, dark "snap" in an otherwise "normal" spell of weather can give the spurious impression of an increasing demand out of all proportion to reality: its effect on the undertaking's load factor can be disastrous and on the cost of bulk supplies from the Central Authority, expensive.

It can be disproportionately costly, too, from the point of view of capital expenditure. A Board's maximum demand may well increase by 50 or 60 MW in a year, but the duration of it may be less than 24 hours during the whole year. The economic picture is thus of 50 to 60 MW of plant being added every year to supply one day's demand.

The months of the first quarter of 1955 provided an almost unbroken spell of cold weather. The actual maximum demands of many Area Boards were considerably in excess of the estimated maximum demands upon which the tariff of the Central Authority had been based. In consequence, they found themselves heavily penalized in respect of a cold, dark period over which they had no control and their merits from the sterling work done on improving efficiency and load factors were completely masked by circumstances.

The very obvious inequity of this state of affairs prompted the Central Authority to introduce a modification into the maximum demand component of the bulk supply tariff whereby the caprices of such imponderables are, to a large extent, discounted.

For the Central Authority, working with national totals (in which the stability of large numbers cannot be ignored) and the resources for collecting the necessary meteoro-

logical data, the problem of assessing the true growth of load is, in many respects, less difficult than it is, say, at Area Board level. In fact, it is safe to assume that, up to a point, the smaller the unit being considered the more difficult this problem becomes.

At the level of the planning engineer who has to decide how soon a major substation's capacity must be increased to cope with the expected load growth, the dangers of accepting maximum demand trend since vesting day as a criterion are considerable. How then to assess true growth of load?

Consumer behaviour is for all practical purposes consistent and by far the most important remaining factor affecting fluctuations of load on a supply system is temperature. This is apparent when maximum demand is plotted against temperature (on an inverted scale as in Fig. 4). If then the variations in load due to temperature could be eliminated the residual load would give a much clearer picture of the true load growth.

The effects of the quite considerable variations in load attributable to lighting are ignored in this instance since the time of the annual maximum demand is, in industrial areas, generally during the period when the full lighting load is being carried.

Bearing in mind that the absolute maximum demand has been described as a freak, a sounder approach to the assessment of true load growth can be achieved by taking for each year load readings at the same time of day on a few days on either side of the maximum and establishing a demand/temperature regression line of the order $y=a+bx$ where $y=$ estimated demand and $x=$ average temperature in deg F for the day. The coefficient b then gives the approximate value in terms of load for each deg F change in temperature. In this way the maximum load for each year can be computed for a constant temperature. The resultant line through these temperature adjusted points for each year will give a fairly accurate picture of the true growth of load.

Components of Demand Curves

Every curve of maximum demand on an undertaking, or part of it, is the sum of the demands of individual consumers. Each consumer makes his contribution to the demand but it would be tedious, expensive and unnecessary to attempt to ascertain the load curve of every consumer in an attempt to assess the contribution which each class of load makes to the peak.

It was said in the previous section that consumer behaviour is, for all practical purposes, consistent: and intelligent "sampling" can tell much concerning the magnitude of the probable component contributed by each class of load to the maximum summated demand. Very detailed investigation into this aspect of load curve analysis was made in Paris just before the war. It was found to be reasonable to segregate the use of the supply into the following groups:—(*a*) Domestic lighting; (*b*) domestic cooking; (*c*) other uses (domestic); (*d*) commercial lighting; (*e*) industrial, plus commercial uses other than lighting. Fig. 5 shows the summated maximum demand on Tuesday, 20th December, 1938. Fig. 5b shows the components of the curve which were contributed by the different groups.[2]

The relative shapes of the curves are not likely to be very different to-day, although the absolute values may have altered with the extension of the use of radio and domestic appliances which has occurred since that time.

An interesting deduction which may be made from the curves is illustrated by the dotted line. This shows what the effect would probably have been had the "daylight saving" advance of one hour on Greenwich time been in operation.

It is seen that the effect would have been to lessen the peak demand in the Paris area by some 40 MW. In fact, the all-the-year-round advance of one hour on G.M.T. plus an extra hour "summer time" was subsequently introduced on the Continent and, whatever its disadvantages may be, it has obviously effected considerable savings in capital investment necessary to meet the peak demand for electricity.

Not always is the maximum demand curve under consideration to be analysed for consumer or consumer-group components. A Board maximum demand curve may be

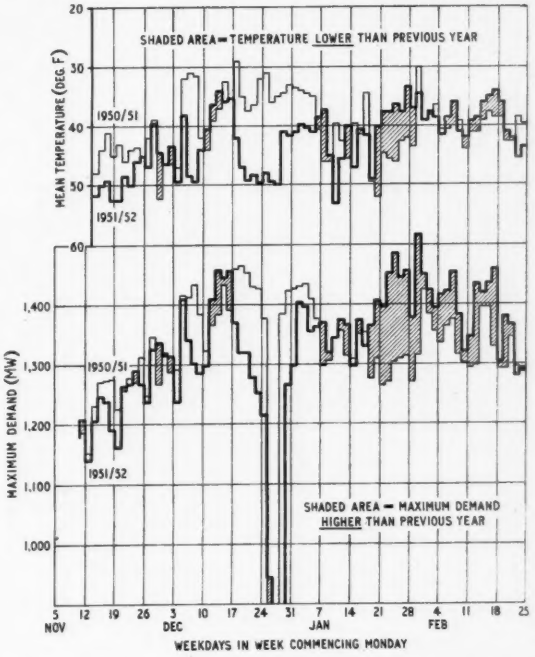


Fig. 4.—The relation between maximum demand and temperature

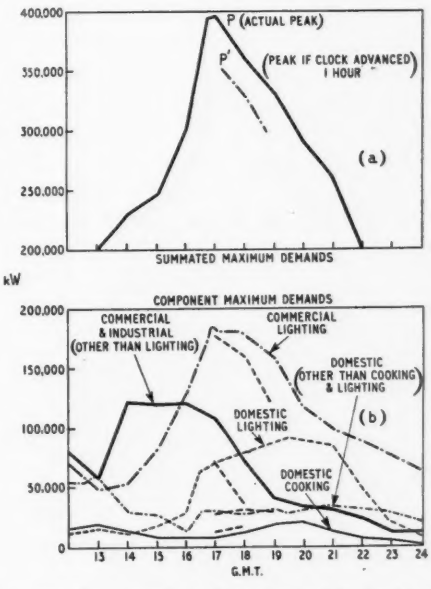


Fig. 5.—Maximum demand in Paris analysed for Tuesday, 20th December, 1938

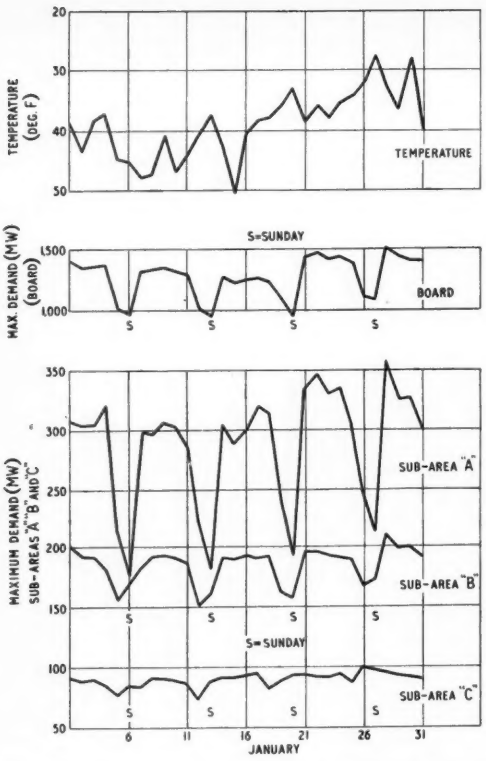
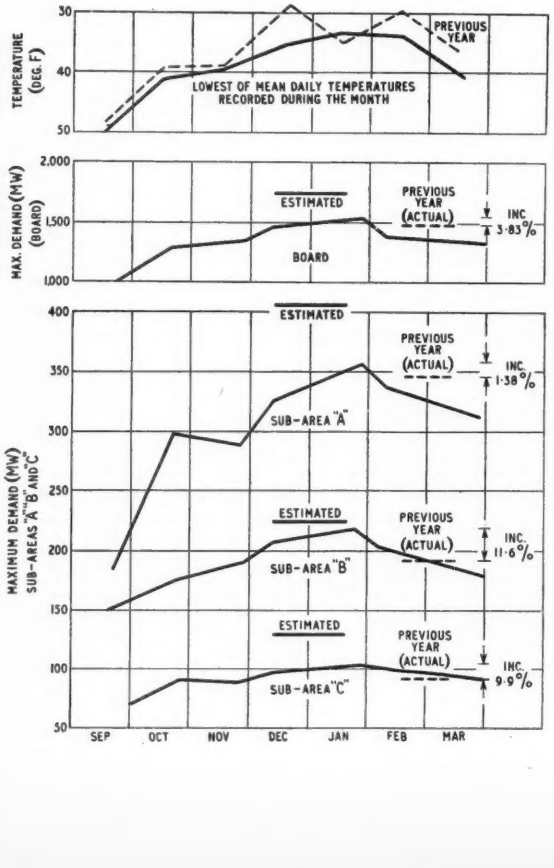


Fig. 6.—Maximum demand curves for an Area Board together with those of its districts. The top graph shows how the temperature fluctuated during the period

Fig. 7.—Load curves and associated estimates



regarded as made up of the demands experienced in its sub-areas or districts. Sub-Areas and Districts may vary in their characteristics equally as widely as consumer-groups, some being predominantly industrial and others mainly rural.

Fig. 6 shows a Board maximum demand curve for January with three of its components which may be designated Sub-Areas "A," "B" and "C." Sub-Area "A" is commercial and industrial, with theatres, shops, offices and many public buildings, Sub-Area "B" is somewhat similar but not so centrally situated, and Sub-Area "C" is mainly residential, but has its quota of large industrial load whose demand does not coincide with the domestic load.

It will be evident that "C," although making a much lower contribution to the Area demand, has a much flatter curve than either "A" or "B," suggesting a more favourable plant utilization factor.

The year's results are seen most easily from the graphical presentation of the data by means of load curves on which are also indicated the estimated demands and the actual demands of the preceding year. Such a presentation is illustrated in Fig. 7.

A more detailed study of the analysis of load components is to be found in Dr. Schiller's excellent papers "An Analysis of the Load on a Modern Electricity Supply System," and "The Application of Statistical Methods to Electricity Supply Problems."[3] [4] The authors wish to express their grateful appreciation to Monsieur Charles Malégarie and his publishers, Ch. Béranger, for permission to reproduce Figs. 1, 2 and 5, and to Mr. L. H. Welch, the chief engineer of the London Electricity Board, for permission to publish this article.

REFERENCES

[1] R. Y. Sanders. Paper VII, I. 10th UNIPEDE Congress, London, 1955. "Report of working group on the investigation of load curves and diversity factors."
[2] Ch. Malégarie. "L'Electricité à Paris." Ch. Béranger, Paris, 1947.
[3] *Journal I.E.E.*, Vol. 91, Pt. II, No. 23, 1944, p. 433.
[4] *Journal I.E.E.*, Vol. 95, Pt. II, No. 44, 1948, p. 161.

Aluminium Corrosion

A.D.A. Information Bulletin No. 21, which is available from the Aluminium Development Association, price 2s, describes recommended practice when aluminium is used in contact with other materials.

The self-healing oxide film always present on aluminium gives it a very high natural resistance to corrosion which often renders surface protection unnecessary. When, however, it is used in connection with a second material and under certain conditions, some simple precautions are required and become an element of good design and installation. The Bulletin describes briefly the causes and types of corrosive attack to the extent that is required and then discusses the practical means of preventing corrosion, such as the use of inhibitors and jointing compounds, the method of cathodic protection, the use of cladding and metal spraying, and it also refers to the advantages of all-aluminium construction.

One section describes the behaviour of aluminium in contact with specific materials which are listed under the subheadings (iron and steel, non-ferrous metals and non-metals) and another deals with practical application in various fields, including electrical engineering.

Tables show (1) an approximate grouping of aluminium and its alloys for exposure in rural, industrial and marine areas, and (2) the behaviour of couples, involving aluminium, when exposed to particular environments such as marine, industrial or conditions of total immersion. An appendix deals briefly with the nature of metallic corrosion and includes a table of solution potentials of metals and intermetallic compounds.

Scottish Water Power

DROUGHT COSTS BOARD £1 MILLION

LAST year's drought, the worst ever known in much of the Highlands, had serious repercussions on the finances of the North of Scotland Hydro-Electric Board. In its report published last week it says that not only were sales to the South of Scotland substantially less, but considerable supplies of electricity had to be "imported." Including the cost of burning more coal at the Board's own steam stations, the extra financial burden amounted to about £1,100,000. There was a loss of £782,154 on the year's operations.

The actual output of the Board's water power stations last year was 840 million kWh, compared with 1,183 million kWh in 1954, an exceptionally wet year. Nevertheless, the year's production represented a saving of 484,000 tons of coal to the country. Plant commissioned during the year increased by 127,410 kW (to 558,795 kW) the capacity available to the Board from hydro-electric plant and raised the potential output from 1,123 million kWh to 1,469 million kWh in a year of average rainfall. New sets were brought into operation at Clachan (Shira), 40,000 kW; Torr Achilty (Conon Valley), 7,500 kW; Errochty (Tummel-Garry), 25,000 kW; Quoich (Garry), 22,000 kW; Finlarig (Lawers), 30,000 kW; and Mullardoch Tunnel (Affric), 2,400 kW.

Progress of Development Programme

The programme of hydro-electric development has now reached the following stage:—Already in operation (including 84,750 kW of the pre-war Grampian scheme), 558,795 kW (average output per annum, 1,469 million kWh); under construction, 310,900 kW (average output, 952 million kWh); and in course of promotion and survey, 418,450 kW (average output, 1,281 million kWh). Six schemes with a total capacity of 11,450 kW were approved by Parliament last year.

The demand for electricity in the area continues to increase and in 1955 it was 12½ per cent more than in the previous year. The total output from the Board's hydro-electric, steam and diesel stations amounted to 1,405 million kWh, a decrease of 142 million kWh. In the latter half of the year, 59 million kWh was imported during the night from the South of Scotland. About 91 per cent of the kWh sent out was used to supply consumers in the Board's area, the balance being sold to the South of Scotland to help to meet day-time peak loads. The average cost of production per kWh at the Board's stations was: hydro, 0·60d; steam, 0·82d; and diesel, 1·79d.

For the first time since 1952 the Board found it necessary to revise its charges owing to increased costs outside its control. The factors which influenced the Board were that annual interest charges were £400,000 greater than it would have had to pay at 1952 rates, coal cost £150,000 more, wages and salaries £230,000 more and contributions to local rates were £80,000 more.

Capital expenditure during the year amounted to £22,076,000 and the aggregate capital expenditure to the end of the year was £140,551,000. In view of the restrictions on capital expenditure, the Board agreed to postpone for the time being any further substitution of diesel plants by hydro-electric power. Its further economy measures will be directed to a careful regulation of the rate and extent of additional distribution work.

A reference to the future atomic power stations is made in the report. As the function of atomic and high efficiency steam power stations is likely to be the production of a steady output of electricity over the 24 hours, it will be necessary to find other means of providing for the peak demand for power. This can best be met by hydro power either of the conventional or pumped storage type. In the Board's area there are several very favourable sites for pumped storage at Cruachan (Loch Awe), Burn of Mar (Balmaha) and Loch Sloy which are being surveyed with a view to eventual promotion in constructional schemes.

Last year the Board connected a further 94 villages, hamlets and new housing areas, providing supplies to a total of 16,015 additional consumers. This was achieved despite the longer lengths of line per consumer now required as the Board's operations extend into the more isolated parts of their area. Street lighting was introduced into 14 villages. Capital expenditure on distribution last year was £4,200,000, giving an average cost per consumer of £262. In 1951, when £2,860,000 was spent on distribution, the average cost per consumer was £152. The Board now serves 338,142 consumers of whom 149,718 have been connected since 1st April, 1948, leaving about 68,258 potential consumers not yet connected.

The rate of increase in the use of electricity by domestic consumers shows no sign of slackening. There are indications that house heating by electricity will before long account for a large part of the total domestic consumption. The all-electric flats at Inverness which are equipped with floor heating have been occupied for more than a year and the occupants are now enjoying the resulting comfort, and cleanliness, of this system of space heating. Recording instruments were installed in one of the houses to obtain precise information concerning the performance of the heating system and the results were made available to the Department of Scientific and Industrial Research. The average cost worked out at about £40 per annum for all purposes.

The popularity of the Aberdeen Town Council's "freedom of choice" scheme, of which mention was made in the Board's 1954 report, continues to increase and during its fifth year 64 per cent of the tenants elected to cook by electricity, as against 58·8 per cent in 1954. Last year a further 10,360 electric cookers were installed in the Board's area.

Heat Pumps

Several domestic heat pumps are on test in various houses. So far the tests show that these appliances can be very effective in providing both a cool larder and a supply of domestic hot water at a very low running cost. Accurate records are being kept of the performance of each of the pumps installed.

Some 48 per cent of the farms and 52 per cent of the crofts in the area now have electricity supplies. Supplies to farms last year totalled 70 million kWh, an increase of 17·5 per cent, the average price per kWh being 1·436d. About 120 all-electric grain dryers are in use in the area. The report says that the Board is disappointed at the reluctance of many farmers to take advantage of the benefits of installing change-over switches for the control of equip-

ment which need not all be used at the same time. This arrangement has the effect of reducing the average price per kWh paid and is of particular benefit to farmers with grain drying equipment.

New industries connected included three boatyards, two barrel factories, one iron foundry, two seaweed factories and six fish processing works. A new factory for the manufacture of small electrical accessories is being erected at Buckie for the British Thomson-Houston Co., Ltd. This is an area where there is considerable unemployment.

The Board is in close touch with the British Transport Commission with a view to an experiment on a rural line with battery coach traction for passenger traffic.

John Brown & Co. (Clydebank), Ltd., have commenced manufacture of a 2,000 kW gas turbine generating plant and delivery to site is planned to commence in September next. Further tests were carried out on the gas turbine at Dundee during the year and the set was connected to the system for the first time in July with a partial output. Since then, the plant has been out of service for further modifications.

John Brown & Co., who are in charge of the wind power experiment at Costa Head, Orkney, report that the weather conditions during the year were not suitable for essential tests. Certain modifications to the windmill are in progress and its operation must still be regarded as experimental.

Transformer/Alternator Surges

WHEN he opened the discussion on the two papers dealing with surges through alternators and alternator transformers, which were reported in our last issue, Mr. R. Davis (N.P.L.) said the problem of surge tests on rotating machines connected to an overhead line system consisted of two parts. One was a study of surge characteristics on the windings of alternators and the other a study of the kind of surges, voltages and hazards to which equipment could be subjected. In his papers Dr. Robinson had dealt with two cases of the second problem and demonstrated that one could not make precise calculations which agreed with the actual conditions. Even the utmost ingenuity could not give solutions which were much better than the solutions derived from considering the simple transformation ratio of the transformer.

Mr. E. Friedlander (G.E.C.) said it was enjoyable to find that fundamentals he himself had laid down in a paper fourteen years ago were still serving a useful purpose and the work was continuing. In the earlier investigation he had assumed equal wave velocities and Dr. Robinson's paper on propagation was invaluable in showing where the varying wave velocities in the different sections of the conductor could be introduced into the theory. However, he had set out mathematical machinery which was not entirely suitable for human consumption; a computer might be helpful.

Mr. L. W. James (C.E.A.) said that surge voltage had given supply engineers a lot of concern for many years. There were failures from time to time which could not be explained and there were some which could only be attributed to transferred surge, but there might easily be other causes. The only case he could recollect over the last seven or eight years where surge was undoubtedly the cause related to two small machines in a medium-sized power station which were connected to the station busbars stepped up to 66 kV through a transformer. A lightning stroke hit the adjacent 66 kV connectors and flashover took place across the transformer bushing. One machine broke down immediately and the other followed suit some time later. Had they been more modern machines with single-turn coils they might have had no trouble.

Mr. R. W. Flux (Bruce Peebles) thought that none of the test methods outlined in the first paper provided a satisfactory solution to the basic question. His suggestion was to ascertain, during works tests, whether a dangerous voltage would appear on an alternator's terminals during surges.

Mr. J. A. S. Hilditch (B.T.H.) criticised the equivalent circuit used in the first paper to represent the machine. With regard to the question why the transferred surge for two-phase shown simultaneously on the two sides should be the same magnitude as for a single-phase surge, he outlined a method which he thought might be of interest. He thought the transformer ratio suggested by Neuve Eglise somewhat questionable. The true turns ratio would lower the values and give reasonable agreement with the actual results.

Mr. R. Bruce (C. A. Parsons) said that the author used essentially rod-gap circuits which were admittedly inaccurate; artificial devices had had to be used to give the results obtained from the experimental work. It must have been disappointing, after all the mathematical work had gone into the paper, to find that very much the simpler method of getting the answer was to use the transformer or turns ratio.

Mr. D. H. Ryder (English Electric) said it had been stated that earthing the alternator neutral made little difference to the voltage distribution, and the inference was that there would be no danger in not earthing the neutral. In his experience the earthing of the neutral of the transformer was a major factor.

Mr. H. M. Lacey (E.R.A.) thought that the transference of surges rarely caused trouble. He knew of one particular case, however, where serious interference with war-time production was caused by the breakdown of low-voltage busbars and on investigation it was found that the trouble was due to surges on the high-voltage side.

Professor M. G. Say (Heriot-Watt College) said he could not understand how one could get a flux in the limb of a transformer in microseconds, in view of the enormous potentialities for getting protection. The method of transfer must inevitably be electrical, or capacitive. The turns ratio came in, in most cases, as a happy accident.

Mr. L. Csuros (C.E.A.) said that Dr. Robinson had made a step forward in the practical problem of how to deal with transformer generator units. The work would be of real help to any practical engineer who had to take account of the various aspects.

Mr. P. G. Ross asked Dr. Robinson to enlarge on a criticism of Lewis in the latter's paper on "The Transient Behaviour of Ladder Networks of the Type Representing Transformer and Machine Windings." This referred to work by Rudenberg and said that a criticism of that work by Robinson was probably based on the idea that the summation of components took no account of magnitudes and phases. The author briefly replied.

London Airport Lighting

AT a meeting of the Illuminating Engineering Society on 14th February, Mr. J. G. Holmes (Holophane, Ltd.) gave a paper on the lighting of London Airport, which he described as setting international standards in some respects for the provision of guiding lights for the control of aircraft. Visual signals were, he said, as essential to a pilot as radio signals. Relatively recent examples of special designs were the centre-line approach lighting system with a wide range of intensity of control on a misty day or a clear night. Runway and taxiway lights were almost flush, but emitted high intensity beams nearly parallel with the ground, while apron flood lights gave uniform lighting over wide areas without illuminating the atmosphere round the control tower. Hangar buildings contained fluorescent and blended (mercury and tungsten) lighting.

Messina Crossing

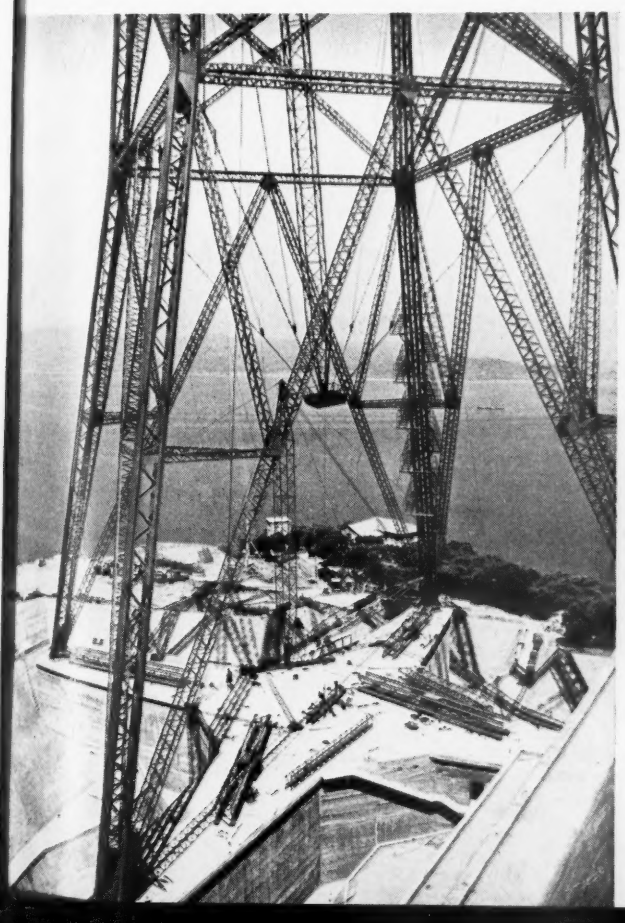
I.E.E. SUPPLY SECTION LECTURE

AN informal lecture entitled "The Crossing of the Messina Straits with a 230 kV Double-Circuit Overhead Transmission Line" was given by Mr. F. Bianchi di Castelbianco at a meeting of the Supply Section at the Institution of Electrical Engineers on 24th February. Mr. L. Drucquer, chairman of the Section, presided, and there was a large attendance. The lecture was illustrated with slides and a film. Further details and some illustrations of this scheme were given in the *Electrical Review* of 15th April, 1955, p. 635.

The work of stringing the conductors was completed in September last. The horizontal distance between the two towers was 12,000ft, the clearance required above the sea being 230ft. The suspension rollers on the island side were 680ft above sea level and the height of those on the mainland side was 1,190ft, the tower being erected on a hill 545ft high. The actual height of the towers above foundation level was 735ft, nearly twice as high as St. Paul's. Counterweights were housed in the island terminal building 2,500ft behind the tower, and the conductors were anchored to a concrete gantry-like structure about the same distance behind the tower on the mainland. The line between the terminals was 16,600ft long, while the conductor, having regard to sag, was about 100ft longer, with another 1,200ft as spare.

Each strand of the conductor consisted of six high-tensile steel wires of a special Swedish make, and one aluminium wire as a core. The diameter of the conductor was 1·1in, its weight was nearly 1·85 lb per ft, its ultimate strength was 56 tons, and its surface tension was 22½ tons, its everyday stress thus being 40 per cent of its ultimate strength.

One of the towers under construction, showing the foundations. In the distance can be seen the land mass on the other side of the straits



To have made the towers triangular would have added 20 per cent to their cost. An important factor leading to the decision to make the towers four-footed was the need to safeguard against the possibility of earthquake disturbance. This necessitated a certain amount of rigidity in the structure, and consequently an all-rigid foundation was provided. The foundation was in the form of a hollow cross, a box-like structure, connecting the four footings of the tower along the two diagonals, and it was designed to keep the tower straight no matter what external forces might tend to tilt it. Difficulties in relation to the foundations occupied a year's work.

Tests carried out with a 1:25 scale model in a wind tunnel indicated that the towers would withstand the specified amount of disturbance even under earthquake conditions. The tests disclosed an unexpected degree of damping in the structure itself, attributed to the soldered splices which had plastic displacement. The bolted splices of the actual structures had a great deal of play which took the place of the plastic displacement of the soldered splices.

The towers were of the rotated base type. This helped in relation to the torsional moment induced by the cross-arm, and it was also of advantage æsthetically, which was valuable, for the project had been condemned by some people on the grounds that the beauty of the spot ought not to be impaired by having an overhead transmission line.

The spread of the top cross-arms was nearly 150ft and the spread of the lower cross-arms 250ft. With full transverse and longitudinal stress the deflection at the end of the cross-arm was 1½ft.

The structure was mostly welded in the shop and by this means it had been possible to make welded assemblies which would have required very complex bolting in the field.

The author said that the erection of the cross-arms had presented a serious problem. The top cross-arm weighed nearly 8 tons and the lower cross-arm twice as much. It had been thought possible to raise them in one piece, first raising the top cross-arm by using derricks and then using the top cross-arm and the derricks simultaneously to raise the lower cross-arm. They had had to think again, but after they had perfected the equipment they saw the cross-arm go up in 35 minutes. It had turned out very satisfactorily, but he would not advise the same method for another crossing.

The author dealt at length with the difficulties encountered during the process of stringing the conductors. The object initially was to put the conductor up without getting it wet, and when it came to doing this across 2¼ miles of water, some serious thinking was called for.

It was suggested that a strong pilot cable should be taken across the water and it should then be used to pull the conductor across. However, the experts said that such a method ought never to be attempted, and that if the cable went into the water it would not be seen again. The

Messina Straits had very strong tidal currents; for only one hour out of six was the water practically at a standstill.

The experts suggested that the pilot cables should be laid out on the beach on either side, attached to floats, and pulled out by tugs until they met and were joined in the middle of the straits. An attempt was made on one occasion to see what would happen, and the results were disastrous. He had seen a tug attempting to pull a medium float, a barge, against the current coming up from Messina; halfway it had had to call for the help of another tug, and the two had been unable to do more than maintain their position until the tide changed.

It was realised that the task could not be carried out with a heavy cable, and the decision was made to use a very light braided cable which could just be kept clear of the water with a pull of some 19 tons. The cable was, in fact, so light that it could be held out of the water at half span by a small fishing boat with a 100 h.p. motor. The attempt was successful, the cable being taken across and joined on the first day.

The straits had been closed to shipping for the attempt. Fifteen vessels were diverted but on the fourth day an 18,000-ton tanker came through in spite of red lights, black balls, wireless signals, fireworks and people waving, and carried all the cables away. The task had to be started all over again.

Twelve days had been allotted for the task, and that was the period for which the straits were closed for shipping, an action which required a long period of notice. The task would have been completed in time but for the accident.

One more chance was requested. By this time there was a certain amount of hostility on the part of the authorities. Navigation could not again be completely stopped; the Messina Straits could be closed to shipping only at night.

It was realised that the task could not be continued in the way in which it had been begun. In the daytime two of the remaining cables were taken and put in the sea, joined in the middle of the straits, pulled with the winches, and came up successfully.

The next conductor cable was successfully strung by the same method. The third fouled a wreck and could not be pulled out. It was cut and, although the cable was pulling 6 tons, spliced in the middle of the straits, and then pulled back to the shore by sheer force. Another attempt the next day was successful. The following day the fourth cable was put across. By 22nd September the four cables were up and finally anchored on both sides.

In a final series of slides, the use of anchored rockets to test the deflection of a tower by means of the thrust they exerted when fired was dealt with.

POWER FROM THE SUN

IN a lecture to the Association of Supervising Electrical Engineers on 21st February, Miss M. V. Griffith (E.R.A.) discussed methods of collecting solar energy, having regard to its diffuseness (up to 10 per cent even on a clear day) and irregular availability. For continuous use, she stated, its price was the cost of storage. The sun radiated 6·3 kW/sq cm and a flat surface outside the earth's atmosphere would intercept 125·7 W or 429 B.Th.U./sq ft/hr, of which at least 30 per cent would be lost due to water vapour, dust and gases before it reached the ground.

In winter an east or west facing surface was useless; a vertical surface was better in winter and a horizontal one in summer. The practicable output limit of solar power units appeared to be 10 kW and competition would be with man or animal power in arid countries rather than with conventional fuels exported from the dwindling resources of more industrially advanced countries; the economic comparison would be between kWh/£ of capital investment and kWh/ton-mile of transport.

Collection of heat energy would require 270 sq ft/kW at 5 per cent efficiency. A tilted flat-plate collector, the methods of construction of which were described, offered the simplest and cheapest form, the angle of tilt being altered appropriately during the day. No useful collection of heat was obtainable below 148 B.Th.U./sq ft/day. In the high humidities of tropical countries and consequent high proportion of diffuse radiation, a flat-plate collector was probably necessary, compared with paraboloid mirror reflectors. The latter, while allowing higher efficiency and greater compactness of the heat engines, required the addition of motors or means to make the mirrors follow the sun.

Experiments were being carried out with metallised plastics as mirrors to cheapen both types of collector. Assuming 50 per cent Carnot cycle efficiency to be obtainable, a solar engine, allowing for absorber losses had been calculated (Heywood) to reach a maximum of 8·5 per cent at 350 deg F for a 10:1 ratio of concentration. For a flat-plate collector the maximum was 3 per cent for an upper temperature of 150 deg F. Particulars were given of several existing solar engines.

Generally, it was more profitable to use solar energy directly for such purposes as cooking, heating, water heating, refrigeration and distillation than for obtaining work from a solar engine. Photo-electric devices offered the best hope of obtaining power from a solar engine, but were at present very expensive and inefficient. Heat stored at a low temperature could be raised to a useful value by a heat pump, which could deliver 50 per cent more heat on a cloudy day from the same collector.

The use of semi-conductors and concentrated solar energy for giving hot junction temperatures with thermo-electric generators gave laboratory figures of 3·35 per cent efficiency.

Summer School of Welding

THE sixth Summer School of Welding organised by the British Welding Research Association will be held at Ashorne Hill, near Leamington Spa, Warwickshire, from 18th to 23rd June next. The course will appeal particularly to managerial staff, research workers, engineers and all those who are in any way concerned with the selection of materials or processes for welding. It is divided into the following four groups, each student being allowed to register for one group only:—Group "A", gas shielded welding; group "B", resistance welding; group "C", metallurgy and physics of welding; and group "D", inspection, testing and quality control in welding processes. Demonstrations relevant to the particular courses will be arranged in collaboration with the electrode and welding equipment manufacturers.

Application forms and programmes of lectures are obtainable from the organising secretary, 6th Summer School of Welding, B.W.R.A., 29, Park Crescent, London, W.1.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Impedance Test Sets

THE testing set described by Mr. Baggott in the *Electrical Review* of 17th February is ingenious, complicated and carefully thought out. The set could be of value to contractors testing extensions to existing installations.

It is not so convenient to installation inspectors testing new installations, however, since, until the test for insulation resistance to satisfy Supply Regulation No. 26 has been made and passed, it is not lawful to connect the installation to the mains, and supply could not be taken from a convenient socket-outlet as would appear to be the intention.

This means that the installation inspector would still have to carry a " Megger " insulation tester to test for compliance with Regulation 26 and, with the 11 lb test set in addition, would require different means of transport than are generally considered adequate.

The test of earth-loop impedance, whilst of interest, is not likely to be very revealing in built-up areas with underground networks where the value is inherently low.

Bromley, Kent. E. H. JESTY, A.M.I.E.E.

IN my letter in the *Electrical Review* of 18th November, 1955, I drew attention to the need for some agreement on the design and minimum requirements for earth impedance test sets. Since then two designs have been described in your columns which may be viewed as the two extremes. Firstly, there is the circuit by E. Roscoe in your issue of 27th January in which a current of at least twice the fuse rating is proposed and is applied at the full mains voltage, and secondly there is the circuit by A. J. Baggott in your issue of 17th February which proposes a current of no more than 3 A at 12 V.

Both of these circuits are ingenious but I feel they fall short of the I.E.E. Regulation requirements and suffer from a few disadvantages in the following respects:—

(1) Both circuits are dependent on the voltage drop down a series connected resistance, thus the accuracy of the indication will be dependent on the power factor of the impedance under test.

(2) Roscoe's circuit does not give a value for the earth impedance but is a " go " or " no go " test determined by the particular circuit constants chosen.

(3) Roscoe's circuit applies a voltage in excess of 40 V and depends for its safety on the high-speed operation of a circuit-breaker.

(4) In applying a surge current lasting 0·01-0·02 sec Roscoe's circuit may give misleading results when compared with a test carried out with a continuously applied current; intermittent faulty contacts may not be apparent under surge conditions.

(5) Although I believe reliable tests can be made at 10 A Baggott's circuit employs only 3 A, and I feel this is too low to give results which could be compared with other methods; in order to increase this current the size of this equipment would become excessive.

(6) The polarity detector, scale expander and insulation tester are very neat additional features in Baggott's circuit, but I feel that they are extra complications which may become troublesome in service.

In order to popularise the earth loop impedance test it is necessary to produce a simple, lightweight instrument at reasonable cost.

South Wimbledon, S.W.19. R. E. JENNINGS, A.M.I.E.E.

"New Lamps for Old"

I WAS very interested to read Mr. R. C. Jefferson's letter in the *Electrical Review* of 24th January, and whilst not wishing to start an extensive interchange of correspondence I would like to clarify one or two technical points.

As customers very seldom have photometric equipment suitable for checking the lumen output from a fluorescent tube it is not easy for them to make an exact comparison of efficiencies, but a very simple means of checking the light output from a reconditioned tube is to install it in a fitting alongside one with a new tube and compare the effect produced by each tube.

The statement that a recently repaired tube will have a light output efficiency almost equal to that of a new tube does not seem to be substantiated by tests which are being carried out on a batch of reconditioned tubes. Nineteen 5ft 80 W " Daylight " tubes of various makes, which had just reached the end of their life, were sent to a tube repairer and returned as reconditioned. Five of these tubes had miscellaneous defects and could not be tested, but the remaining fourteen tubes were tested for initial efficiency and the average value was found to be 42·6 lumens per watt. Seven tubes were then selected at random for life testing and at the time of writing have just completed 500 hours' operation. The average efficiency of the seven tubes is given below and, as the ages of the tubes vary between October, 1947, and January, 1953, efficiency values have also been included for tubes manufactured during the period 1947 to 1952 as well as for " Daylight " tubes in current production.

Type of Tube	Date of Manufacture	Lumen per Watt Efficiency Initial	100 hour	500 hour
Reconditioned	1947 to 1953	42·4	36·9	31·7
New	1947 to 1952	49·0	46·0	43·0
New	1956	58·0	55·0	52·0

The above results show the average reconditioned tube to be 26 per cent less efficient after 500 hours' use than when it was originally used and 39 per cent less efficient than a tube from current production. The main point to note is that even if the reduction in efficiency is only 25 per cent, then a quarter of the electrical energy consumed by the tube is being wasted. Since the 5ft 80 W tube consumes 500 kWh during a life of 5,000 hours then, allowing 1½d/kWh, the wasted electrical energy will cost more than 15s and this more than counteracts any apparent saving due to the lower price of a reconditioned tube.

My final comment is regarding the statement that tests have been carried out on reconditioned tubes which have achieved the equivalent of 26,000 burning hours including over one million switching operations. This apparently refers to a forced life test under which the tube arc was struck one million times and that this has been estimated as representing a normal life of 26,000 hours. Unfortunately, the relationship between the number of switching

operations and the life to be expected from a tube is not sufficiently accurate to enable forced life tests to be used. The only positive way of determining the life of a fluorescent tube is to run it for a full life test on a three-hour switching cycle.

London, W.C.2.

G. V. MCNEILL,
Technical Sales Department,
Atlas Lighting Division,
Thorn Electrical Industries, Ltd.

NEW BOOKS

Electrical Who's Who. Fourth Edition. Compiled by *Electrical Review*. Published by Electrical Review Publications, Ltd., and distributed by Iliffe & Sons, Limited, Dorset House, Stamford Street, London, S.E.1. Price 21s net (postage 1s 5d).

When the first edition of this guide to the people in the electrical profession and industry appeared in 1950 it was hailed as a reference book which met a long-standing need. Not only was it found invaluable within the electrical industry, it was welcomed by those outside who were concerned in any way with electrical affairs. This is a wide circle, for electricity enters every sphere of modern life.

The new edition has been considerably enlarged and now there are about 7,000 entries. They cover men and women in every branch of the electrical industry and profession—electricity supply, electrical manufacturing, contracting, consulting, research, transport, mining and trade associations. In addition the names of leading electrical people in the Admiralty, the Post Office, the Ministry of Supply and other Government Departments are included.

Details are given of the positions and previous appointments of the men and women dealt with, as well as their qualifications and professional activities. An extensive section of the directory is an index in which all biographical entries are classified under the titles of their companies and other organisations. This has proved a useful feature for reference purposes.

The complete and up-to-date information gathered for this new edition will make it an indispensable reference book for all connected with the electrical industry.

Power System Plant. Edited by E. Openshaw Taylor. Pp. 307; figs. George Newnes, Ltd., Tower House, Southampton Street, London, W.C.2. Price 30s.

The success of a number of lectures given in an advanced course on power system plant at the Heriot-Watt College, Edinburgh, has led to their preparation in the form of this book. Altogether there are eight chapters, the first two of which deal with the mechanical problems and electrical behaviour of synchronous machines in a lucid and concise manner. The third chapter is devoted to load frequency and excitation control of synchronous machines and it describes the nature and purpose of control complete with details of the various types of regulators.

After dealing with certain aspects of transformer design, types of transformers, and the various methods of cooling and connecting transformers, there is an interesting and informative section dealing with the design requirements for switchgear, which will be of particular interest to all power system engineers. A more practical section follows describing most of the plant associated with both large and small substations. Adequate treatment is given to switchgear, current and voltage transformers, fire-fighting equipment, and oil purification plant. After a chapter dealing with underground cables the book concludes with a most useful and practical section in which the author outlines the factors affecting the selection of routes for overhead lines. Details are given of calculations involving cross arm design, sag temperature, etc., and there is an explanation of the use of the sag template.

Each section of this book has been written by an engineer closely connected with both the theory and practice of his subject and throughout the book the latest developments have been brought to the attention of the reader in a commendable fashion. Altogether it is an interesting book covering a very wide range of topics and although each section cannot be expected to be ideally comprehensive a balanced picture is presented and the book will undoubtedly be of value to both the student and practising engineer. —F.B.C.

BOOKS RECEIVED

Electric Motors and Controls. Pp. 278; figs. The British Electrical Development Association, 2, Savoy Hill, London, W.C.2. Price 9s. (post free).

Basic Processes of Gaseous Electronics. By Leonard B. Loeb. Pp. 985; figs. University of California Press, Berkeley 4, California. Price $13.50.

Rural Electrification Conference

MEMBERS of the staffs of every Electricity Board in England and Wales, except London, and of the South of Scotland Board, and of the Electricity Board for Northern Ireland and the Electricity Supply Board, Dublin, will attend a Rural Electrification Conference at the University of Nottingham School of Agriculture, Sutton Bonington, Loughborough, from 17th to 21st April. The conference is the third to be organised by the British Electrical Development Association; there will be 110 delegates in residence at the school.

Delegates will arrive and register on the evening of 17th April, and the conference will open on the following morning with an address by Mr. C. T. Melling, chairman of the Eastern Electricity Board and chairman of the E.D.A. Rural Electrification Advisory Committee. This will be followed by the first paper, which is to be given by Mr. P. J. Dowling, engineer-in-charge, Rural Electrification Office, Eire Electricity Board, on "Rural Electrification in Eire."

In the afternoon, with Mr. J. I. Bernard, chief technical officer of E.D.A., in the chair, an address will be given by Mr. E. A. Holland, agricultural officer, Fens Sub-Area, Eastern Electricity Board. He will speak on "Crop Conservation and Load Building." A conducted visit of the University Farm will take place in the evening.

On Thursday, 19th April, about 40 members of the National Agricultural Advisory Services and the Agricultural Land Services will join with the Electricity Boards' representatives for a day of joint sessions. With Professor H. G. Sanders, chief scientific and agricultural adviser to the Ministry of Agriculture, as chairman, the first paper will be given by Mr. F. Henderson, an Oxfordshire farmer. He will speak on "What Electricity Means to Me." Mr. C. W. N. Miles, a land agent, will give an address on "Finance: Land Owning and Electricity." The final session of the day, under the chairmanship of Dr. J. D. Ivins, a lecturer at the Sutton Bonington School, will be devoted to a general discussion.

"Farm Installations and Earthing" is the title of the first address to be given on the Friday (20th April), by Mr. P. H. N. Turner, senior commercial engineer, Mid-Sussex Sub-Area, South Eastern Electricity Board. Mr. H. W. Grimmitt, Ministry of Fuel and Power (and a member of the E.D.A. Rural Electrification Advisory Committee), will preside at this session. In the afternoon, under the chairmanship of Mr. C. A. Cameron Brown, agricultural electrification adviser, Central Electricity Authority, a paper will be delivered on "Electricity and Poultry Husbandry" by Mr. W. Moore, poultry husbandry and building construction lecturer at the National Institute of Poultry Husbandry, Harper Adams College.

The concluding session, with Mr. J. I. Bernard as chairman, will be devoted to discussion and questions relative to the work of rural electrification and the conference. At this session also, Mr. C. A. Cameron Brown will give an informal account, illustrated by a short film, of his visit to the U.S.S.R. to examine the uses of electricity in Soviet agriculture.

The first dinner of the Society in 1906

Batti-Wallahs' Society

ORIGIN AND HISTORY

THIS is the golden jubilee year of the Batti-Wallahs' Society, which was formed on 16th January, 1906, and the annual ladies' night to be held on Friday next at the Connaught Rooms, London, always a popular social event, promises to be one of the outstanding social electrical functions of the season. Many prominent people from all branches of the industry will be there. The present, therefore, is an appropriate time to outline the origin and history of this old-established Society.

Mr. L. M. Waterhouse, first president

Despite its antiquity we are still asked "What is a Batti-Wallah?" and "What are the objects of the Society?" The term "Batti-Wallah" is the Hindustani for lamp-man and was given in the early days to sea-going electrical engineers with the Peninsular & Oriental line who were then solely concerned with electric lighting on board ship. The Society was formed with, perhaps, the best of all objects—to promote social intercourse amongst its members. Over the years the constitution of the Society has changed, but its original purpose has remained unaltered.

Actually it was in 1905 that Messrs. E. L. Pinching, W. Riggs and E. Sheppard, all P. & O. electrical engineers, met at the Cannon Street Hotel to discuss the idea of bringing together P. & O. Batti-Wallahs. In the following year, a committee approached the P. & O. Company for permission to use its flag and monogram, and although this was not granted, the Club was given the title of P. & O. Batti-Wallahs. Mr. L. M. Waterhouse was elected first president and the first dinner was held at the Holborn Restaurant in March, 1906, at which, it is recorded, Mr. R. J. Elmhirst spoke of the rapid advance which the uses of electricity had made on board ship, stating that on the newest boats "as much as 1,000 amperes are used for power and almost as much again for lighting."

One of the earliest social functions at which ladies were present was in June, 1906, at Hampton Wick. The *Electrical Review* reported that "the weather was everything to be desired, and the river was well patronised. Two motor-boats and other river craft were provided for the use of the guests, the president's new motor-boat cruiser, the *Lady Kate*, being very much in favour, and numerous trips up and down the river were indulged in. Music, croquet and other games were enjoyed."

An interesting example of the early use of electricity on board ship is recorded in connection with one of the Society's earliest visits to the Tilbury Docks to inspect the equipment on the P. & O. liner s.s. *Mooltan*. The *Electrical Review* described the equipment as follows:—

"The plant installed consisted of five two-crank engines coupled up to four-pole dynamos of the Siemens-Belliss & Morcom combination, and one smaller generating set placed on the upper deck, with a small donkey boiler for emergency use. The wiring for the upper decks is connected to the main board through a branch board in the emergency engine room, thus arranging for lights on the upper decks should the main engine room be flooded through mishap. The five main sets generate each 350 amperes at 105 volts, the low voltage being the only unchanged feature since the days when the older members were at sea. Two sets feed the motor circuits, two the lighting circuits and one is spare. The ammeters, starting switches and speed regulators for the many motor circuits were the first means of bringing home to the members the fact that a great change has taken place. The five forced-draught fans were driven by electric motors,

as were two large fans ventilating the engine room, and many applications of electricity were seen in different parts of the ship. A large number of cabins were provided with small electric fans, and in the pantry and galleys very interesting examples were seen, such as an electric motor for turning the spit in the roasting ovens, and also electric plate and dish washing machines."

In the next few years it was found that the informal meetings were not attracting sufficient numbers, and it was therefore decided to extend the scope of the Society by including engineers other than those who had served with the P. & O. With this object in view, membership was extended by introducing three grades:—Members: Past and present P. & O. electrical engineers. Associate members: Sea-going engineers. Associates: Anyone engaged in the electrical profession. At the same time the name of the Society was changed to its present style.

In 1912 the strength of the Society was such that it was felt that it could maintain its own journal and in December of that year the first issue of the *Batti-Wallahs' Journal* made its appearance, in which the social activities of the Society were recorded. With the intervention of the 1914-18 war, however, the journal ceased publication.

The first world war brought many changes of habit. Members had removed their homes farther from London and were less inclined to stay behind in the City after office hours. It was decided, therefore, to discontinue the evening functions and to substitute monthly luncheons. In the spring of 1922 a move to revitalise the Society was made by three of the original members (Messrs. Avila, Riggs and Waterhouse). Those who could not promise to be active members were struck off and with some fifty stalwarts the Society commenced its vigorous new life. The rules of membership were revised and admission to the Society was greatly restricted, the object being to have a distinguished rather than a large membership.

In 1932 it was decided that the Society should bestow some mark of recognition on gentlemen who had addressed it or had otherwise furthered its interests, and honorary membership was instituted. The first two honorary members were Col. R. E. Crompton and Sir Hugo Hirst (later Lord Hirst). At the present time there are five honorary members—Earl Mountbatten of Burma, Sir Edward Crowe, Sir Harold Bishop, Mr. M. R. Gardner and Mr. W. Lang. Since 1922 the luncheons have been addressed by many famous men from all walks of life, the most distinguished being Earl Mountbatten of Burma.

The long list of men who have presided over the Society's activities includes many well-known names—E. L. Pinching, Walter Riggs, J. Snow Huddleston, Haydn T. Harrison, F. Pooley, W. McClelland, J. S. Highfield, W. E. Highfield, Sir Montague Hughman, Col. Sir Thomas Purves, P. V. Hunter and Sir John Hacking—to name but a few, and its prestige is such that they have considered it an honour to be asked to serve. The president for the past year has been Mr. G. O. Watson, of Lloyd's Register of Shipping, who will hand over his badge of office to the new president at next week's ladies' night. The Society has had six honorary secretaries (" Mates "), those having the longest service being Mr. J. F. Avila (1907-1911), Mr. F. Pooley (1912-1921) and Mr. Mark Whitgift (1922-1948); the present " Mate," Mr. T. C. F. Bigland, took over the onerous duties in 1951.

Digital Computer Techniques

IT is now nearly seven years since the first general-purpose computer was put into full operation in this country. Since that time considerable advances in techniques of construction and of development have been made here, in the United States and in several other countries, and the field of interest has widened from that of a few specialists to a very large number of scientists and to those working in the many fields of application, such as control of processes, business works, and translation of languages. Although the enormous contribution which digital computers can make in scientific research and engineering design is well understood, and their possible application in other fields is developing on a broad front, the number of computers actually in use in this country is still very small. To encourage the greater application of technical effort which is needed to take full advantage of the potentialities of computer techniques the committees of the Measurement and Control and the Radio and Telecommunication Sections of the Institution of Electrical Engineers have arranged a convention on the subject.

The convention will be held at the Institution from 9th to 14th April and will be opened by Sir George H. Nelson, Bt., President of the Institution. Sir Cyril Hinshelwood, M.A., D.F.C., F.R.S., President of the Royal Society, will deliver the opening address, after which Prof. F. C. Williams, F.R.S., will give an introductory lecture. On the three following days there will be classified sessions, held simultaneously, and it is interesting to note that some will be of a general nature for non-experts, while the others will be directed at specialists. At the general sessions information will be presented on the latent possibilities in the application of digital computers in laboratories, factories and commercial offices. The specialist sections will provide an opportunity for experts to discuss the latest developments in British techniques, the intention being to present a programme which will interest both mathematicians and engineers alike.

On the remaining two days, visits to typical computer installations in London and the provinces have been arranged for visitors to the convention. Members and non-members of the Institution may attend the convention, the latter being required to pay a registration fee of £1.

In the ten general sessions the papers will cover engineering, scientific and business applications of computers, and their application in industrial control. The construction and performance of both commercial and experimental machines will be described, and a whole session will be devoted to the present state of development and future prospects of the transistor. Other important aspects of the computer will be covered in the remaining general sessions and in the seven specialist sessions. Altogether thirty-six papers have been accepted for the convention, but there will also be a number of short oral contributions by experts. The complete proceedings of the convention containing the addresses, lectures, the full text of all the papers, and reports on the discussions will be published in supplementary issues to Part B of the *Proceedings* of the Institution.

Scottish Hydro-Electric Developments

IN a lecture to the Society of Engineers on 5th March, Mr. A. A. Fulton gave an account of the present trend of hydro-electric developments in Scotland. After reviewing the historical background of his subject, the author referred to factors influencing the design of works since the formation of the North of Scotland Hydro-Electric Board in 1943, including topographical and geological considerations, the preservation of fish and amenities. He next dealt with the effects of seasonal variations in rainfall and availability of materials and labour and of improvements in design of waterwheels and control gates. The probable influence of nuclear power in increasing the need for hydro-power and large-scale pumped-storage projects was also considered.

PARLIAMENTARY REPORT

THE House of Commons Committee which is dealing with the Clean Air Bill last week considered amendments to Clause 5, which contains the requirement that new furnaces shall be fitted with plant to arrest grit and dust. Specifically, it states that no furnace in any building shall be used to burn pulverised fuel or to burn, at a rate of ten tons an hour or more, solid fuel in any other form, unless the furnace is provided with plant for arresting grit and dust which has been approved by the local authority. Mr. Enoch Powell, Parliamentary Secretary, Ministry of Housing and Local Government, said that various Opposition amendments involved the question of the qualifying rate of burning. The Minister was satisfied that the figure of 10 tons per hour was much too high and after obtaining the views of the committee and other information he intended to propose at the next stage of the Bill a substantially lower figure.

Minister and L.E.B. Chairman

Mr. Gresham Cooke asked the Minister of Fuel and Power what further communication he had received from the chairman of the London Electricity Board about the criticisms by the chairman of the working of the wage negotiation machinery in the electricity supply industry.

Mr. Aubrey Jones, in a written reply, stated: "In the further communications that I have had with the chairman he has not withdrawn, nor have I asked him to withdraw, anything said on this subject in his letters to the Press or in our previous conversation."

Suggestion Schemes

In a debate on a motion asking the Government to encourage the adoption of suggestion schemes, in which employees in industry are given rewards for ideas which improve the efficiency of production, Mr. Graham Page gave as an example of the value of such schemes the experience of Hoover, Ltd. He said that the firm estimated that in 1953 they saved £80,000 as the result of adopting employees' suggestions. Another company, which had 14,000 employees producing batteries, had operated a scheme for 35 years and each year it paid out between £6,000 and £9,000 in awards for the suggestions and ideas which had come up from the man on the job to the top-level management.

Mr. C. W. Gibson gave an account of how building operations in London had been speeded up by the use of small electrical tools in place of tools worked by hand.

Mr. John Hall said it was essential for firms to get the trade unions working with them because it was essential to eliminate the fear that if men put forward good ideas they might be working themselves out of a job. He thought there should be a national organisation which would ensure that ideas produced through suggestion schemes should have wide circulation throughout industry.

Mr. Frederick Lee referred to Mr. Page's suggestion that as automation was increased in industry there would be more and more opportunities for workers to make suggestions. He doubted this. By introducing electronic processes into the production of machine tools, etc., we were eliminating the machine-operator type of employee. He realised that there would be an increasing need for more boffins, technologists and technicians at the centre of the automatic factory, but our educational system at the moment was not producing them. It might be that we should have heavy unemployment among the machine operators and a great demand for the boffin and the scientific worker which we should not be able to meet. That was why there was some reticence within organised labour in this second industrial revolution. So far there had been no planning and no attempt to ascertain the economic or social consequences of automation.

The sooner we could set up at national level bodies which could examine the effects of these innovations—in order that we could either find out the extent of the damage that would be done by them, or satisfy organised labour that there was not a great deal to fear from them—the sooner it would be possible to facilitate co-operation for increased production and to go ahead at a much greater pace. It took a long time for new ideas to be applied in the workshops. He was impressed, on examining productivity reports, at the greater time-lag in Britain compared with industry in the United States.

Mr. Robert Carr, Parliamentary Secretary, Ministry of Labour and National Service, said the Government had no difficulty in accepting the motion because they believed that suggestion schemes were a part of the structure of good management. The basic need was that there should be a good system which commanded the trust of employees—a system for the collection of ideas, for the assessment of their usefulness and for a reward, both immediate and sometimes continuing, that was appropriate. When management gave the lead, the Government looked to the unions to respond in co-operating to achieve higher productivity.

It had been suggested that the Government should set up a body to study automation. But researches were already going on under the auspices of D.S.I.R. and the Medical Research Council into some of the fundamental problems associated with automative processes. The Government were expecting these reports soon and wanted to see them before considering the matter further. The Government was doubtful about the value of setting up a national body to deal with suggestions. There were already a variety or organisations which together could do what was needed. It was possible that a national body would not only co-ordinate, but would also sometimes cause delay and remove the ideas from their point of application.

Automatic Production Control

Mr. Owen asked the President of the Board of Trade if he was aware that, under the auspices of the European Productivity Agency of the Organisation for European Economic Co-operation a group of European technicians, sociologists, and trade unionists had been investigating the use of automatic production control processes in a number of countries and if he would set up a similar group under his department for investigations in Britain.

Mr. Walker-Smith, Parliamentary Secretary, Board of Trade, said a number of countries had agreed to make factual surveys and case studies of the application of automatic processes in their territories and would be discussing the results at a conference to be organised in due course by the European Productivity Agency. The United Kingdom would take part in this conference and the Government saw no need to set up any separate group in this country.

Deferment of Engineering Graduates

Mr. Beswick asked the Minister of Labour whether, in view of the overriding need to achieve the most effective deployment of our scientific manpower, he would now reconsider his decision to call up engineering graduates of a recognised engineering institution.

Mr. Iain Macleod said the present arrangements for the indefinite deferment of engineers and scientists for certain designated work were limited, and covered, with very few exceptions, only men with university degrees. He could not extend this scheme in the way Mr. Beswick suggested.

Uranium Supplies

Mr. Arthur Henderson asked the Prime Minister whether, in view of President Eisenhower's offer to supply uranium to other countries, he would propose consultations between the United States and Great Britain in order to promote international co-operation in the financing and construction of atomic reactors in Asian and African countries.

Sir Anthony Eden said the use of President Eisenhower's welcome offer to supply uranium for the development of the peaceful uses of atomic energy needed careful thought. Meanwhile a start had been made in the Colombo Plan and the Bagdad Pact, as well as by other arrangements, to help countries in Asia and Africa in training in the peaceful uses of atomic energy.

Mr. Henderson asked whether the British Government would follow the American example and make supplies of uranium available to other countries for research and development purposes.

The Prime Minister said these supplies were scarce and we were not placed like the United States. He could not hold out hopes that we might be able to follow their example.

Mr. E. Fletcher asked if the Government would give technical and, if necessary, financial help to countries in Asia and Africa to enable them to benefit from the economic use of nuclear energy.

Sir Anthony said the Government had been doing that. They had certain plans to help the underdeveloped countries in Africa and Asia to form a nucleus of trained technicians, which was their first need.

Nuclear Power Questions

Mr. Moss asked the Lord Privy Seal how soon it would be before British firms which accepted contracts to build nuclear reactors in foreign and other overseas territories would be able, in co-operation with the Atomic Energy Authority, to supply nuclear fuel as part of the contract.

Mr. Butler replied that if the reactors required natural uranium, the Atomic Energy Authority was confident that this would be available as soon as it was required. Supplies of enriched uranium were limited, and had to be shared between defence and civil needs. Some of the civil share would be reserved to meet export requirements.

Mr. Wade asked the Lord Privy Seal why the Atomic Energy Authority had given guarantees to certain groups of contractors and civil engineers that they would be employed to build the first four atomic power stations for the Central Electricity Authority; and why the Atomic Energy Authority had advised against the civil engineering work being put out to public tender.

Mr. Butler said the Atomic Energy Authority had given no such guarantee. The invitations to tender for the atomic power stations to be built for the C.E.A. and technical advice given in this connection by the Atomic Energy Authority were the responsibility of those authorities, and not of Ministers.

Mr. Butler told Mr. Osborne that the first commercially operated nuclear power stations would come into operation in 1960-61. It was estimated that the cost of electricity generated in these stations would be about 0·6d per kWh; this was approximately the same as the cost from a modern coal or oil fired station.

Price of Electricity and Gas

Mr. Ernest Davies asked the Minister of Labour if he would state the percentage rise that had taken place in the retail prices of electricity and gas since vesting dates, respectively, and how they compared with the movement during the same periods in the general index of retail prices.

Mr. Macleod replied that at January, 1956, the index of retail prices was about 42 per cent higher than in April, 1948, and about 39 per cent higher than in May, 1949. He could not give corresponding percentages for individual items included in the index, but for the sub-group which covered prices of electricity, gas, oil and candles, taken together, the average rise had been about 56 per cent since April, 1948, and about 51 per cent since May, 1949.

Wages in Nationalised Industries

Mr. Ernest Davies asked the Minister of Labour what were the percentage rises in average wage rates in the nationalised electricity, gas and mining industries since the respective vesting dates and how they compared with the movement during the same period in the index of weekly wage rates.

Mr. Macleod said that from the dates when the electricity, gas and coal mining industries were nationalised up to the end of January, 1956, the index of rates of wages showed a rise of about 48 per cent, 44 per cent and 57 per cent, respectively. Owing to the large number of different rates of pay in these three industries he was unable to give figures showing the percentage increases in average wage rates.

Rural Electrification in Wales

Mr. Gower asked the Minister of Agriculture what number of farms in Wales had been connected to electricity in the past year, what proportion of farms in Wales were so connected during the past year, and how this proportion compared with the proportion so connected in England.

Mr. Nugent, Parliamentary Secretary, Ministry of Agriculture, said that 3,051 farms in Wales were connected to a mains supply during 1955. This represented 6·9 per cent of the farms considered capable of being connected to a mains supply compared with 5·4 per cent in England.

Capital Expenditure in Scotland

Mr. Nabarro asked the Secretary of State for Scotland whether he would now state the reduction proposed in the capital investment programmes of the Scottish Electricity Boards.

Mr. J. Stuart replied that the transfer of responsibility last year from three authorities to the South of Scotland Electricity Board made estimating for the current year specially difficult. Capital expenditure in the area in 1955 was approximately £15 million and the Board proposed to spend £20·7 million in 1956. Closer consideration made it possible to reduce this estimate to £19·1 million. This revised figure had now been reduced to £17·5 million. This second reduction of £1·6 million was attributable to distribution and as a result the rate at which new consumers could be connected and the scale of hiring of electrical appliances would be reduced.

The North of Scotland Hydro-Electric Board's forecast programme for 1956 was £19 million, but in response to the Government's request for curtailment of capital expenditure, it had reduced this to £18·7 million. This figure would be further reduced to £18·4 million. Of the total curtailment of £600,000 half was attributable to generation and main transmission and the other half to distribution. These reductions would involve the deferment of the start of work on two small generating schemes in Lewis and Harris where supplies would continue to be given less economically from diesel plants, of the small mainland projects of Mucomir and Glashan, and of certain other works. It would also be necessary to reduce the rate of connecting new consumers and to curtail the hiring of electrical apparatus.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 15th March:—

RENTRIX. No. 743,077. RENTRIX (design). No. 743,078. Class 9. Electrical apparatus and instruments; weighing, measuring, signalling, checking (supervision) apparatus and instruments; and cash registers and calculating machines.—Rentrix Commercial Counting & Control, Ltd., 16, Grosvenor Place, London, S.W.1.

BLUE SPOT (design). No. B745,618. Class 9. Apparatus for use in physics; optical, surveying, signalling, measuring, photographic and cinematographic apparatus; electrical and electronic apparatus; radio broadcasting apparatus, radio sets (complete), television transmitting and receiving apparatus, mobile radio transmitting and receiving apparatus, sound amplifying apparatus; talking machines and oscillographs; and parts.—Blaupunktwerke G.m.b.h., Hildesheim, Germany. Address for service, c/o W. P. Thompson & Co., 12, Church Street, Liverpool, 1.

RADIVET (design). No. B745,124. Class 9. Testing instruments for frequency modulated radio receiving apparatus.—Airmec, Ltd., Cressex Works, Cressex, High Wycombe, Bucks.

IBAC. No. 748,663. Class 9. Instruments, apparatus, systems and parts for the production, transmission, reproduction, control, measurement, detection or indication of electric signals.—Central Rediffusion Services, Ltd., Carlton House, Lower Regent Street, London, S.W.1.

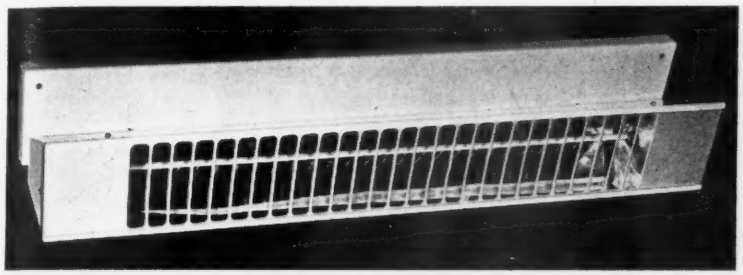
PHOSCO. No. 733,997. PHOSWARE (design). No. 733,998. Class 11. Lamps and fittings, all for street lighting.—Concrete Utilities, Ltd., Great Amwell, Ware, Herts.

LEKTRA. No. 745,506. Class 11. Electric lamps.—African Lamps (Proprietary), Ltd., Johannesburg, South Africa. Address for service, c/o Joseph Harris & Co., 63, East Walk, East Barnet, Herts.

NEW ELECTRICAL EQUIPMENT

Radiant Heater

The new "Radisil" radiant heater announced by HANOVIA (LAMPS DIVISION OF ENGELHARD INDUSTRIES, LTD.), Bath Road, Slough, Bucks, is of unorthodox design and is claimed to be one of the safest and most economical on the market. It consists of a cream stove enamelled sheet steel fabricated back plate; a hinged brass reflector, chromium-plated on the reflecting surface, housed in a sheet steel trough; an element of self-supporting spirally wound nickel-chrome wire enclosed in a silica sleeve; and an anodized aluminium grille safety guard. The reflector housing can be moved up or down through an angle of nearly 120 deg.



"Radisil" radiant heater

The complete unit weighs 6½ lb and is 26in long by 3½in high and 4¾in deep. The elements are each 20in long and ¼in in diameter and are available in 250, 500 and 750 W loadings, suitable for 200/230 or 230/250 V.

The price, excluding the element, is £3 8s 4d plus £1 10s 9d purchase tax in the United Kingdom. The elements, irrespective of wattage, cost 15s each.

Two larger models, 48in and 72in wide, are scheduled for later production. They are designed for use where greater heating capacities, up to 3 kW, are required.

Continuous Electrode

QUASI-ARC, LTD., Bilston, Staffs, announce the addition of the "Firmec" electrode to their range of continuous electrodes for use on "Fusarc" automatic welding machines. The "Firmec" electrode is designed for the welding of mild steel in the flat position and is particularly suitable for fillet welding and single pass butt welds, in thicknesses from $\frac{3}{16}$in to $\frac{3}{8}$in. High welding speeds are possible with this electrode, since a larger size of electrode than normal can be used for any given fillet weld size. This special feature also results in reduced material costs and enables the electrode to be used for making the smaller sizes of fillet welds where appropriate.

The welds deposited with the new electrode have a very smooth appearance and the slag detachability is good. They are recommended for shipbuilding and general engineering applications and particularly for work where high quality finish is essential. The electrode is made in sizes 12 s.w.g. to 4 s.w.g. and complies with B.S.639 : 1952.

Self-Priming Pump

A new range of automatic self-priming pumps has recently been introduced by SIGMUND PUMPS, LTD., Team Valley, Gateshead, 11. This has been developed to meet the demand for an efficient and reliable self-priming pump suitable for a wide range of low and medium head industrial pumping applications, and to overcome the priming difficulties encountered with the conventional type of centrifugal pump. The range is known as the "G" series.

Once primed, no liquid circulates within the pump; all the power is used for positive work and the pump duty is performed at top efficiency. No foot valve is needed. Once the pump case is initially filled, the pump primes and re-primes, clearing any air or gas which may enter the suction line. Automatic priming takes place on suction lifts up to 25ft.

The pump range covers units from 1½in to 8in branch sizes and outputs from 30 to 1,600 g.p.m., providing for almost every industrial application for which a single stage centrifugal pump can be used.

Waveform Generator

A new low-frequency waveform generator, type L.F.51, by SERVOMEX CONTROLS, LTD., Crowborough Hill, Jarvis Brook, Sussex, provides what they believe to be the most flexible source of test signals yet available for servo-mechanisms and electrical controllers in general. The instrument covers a wide range of frequencies and amplitudes and the d.c. level of the output signal is variable. There are also eighteen different waveforms available.

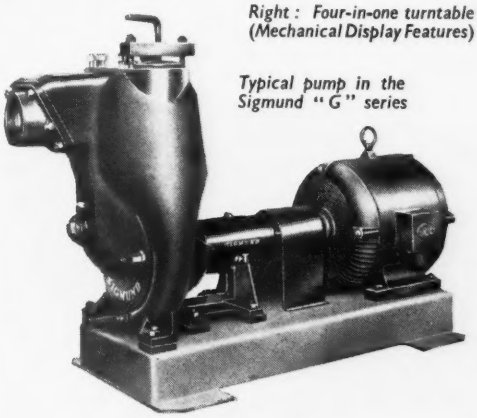
Square waves with pulse times of 1 millisecond will test systems with bandwidths extending up to several thousand cycles per second. At the other extreme it is possible to generate a single isolated ramp function lasting 1,000 sec, which is slow enough to test the majority of process controllers.

The instrument can also be used as a controller rather than a tester and yet another application is for electrical stimulation of nerve cells.

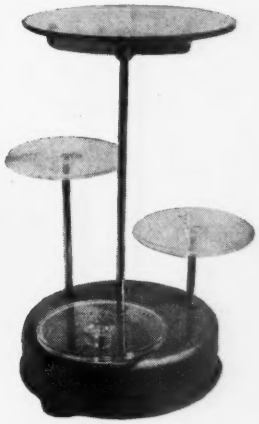
Four-in-One Turntable

A new multi-plate turntable which is claimed to save a considerable amount of space on display by means of its special construction, is now available from MECHANICAL DISPLAY FEATURES, 40, Gerrard Street, London, W.1. Goods can be displayed on the four plates all of which rotate at the same time, and the interchangeable short and long rods make it possible for the articles to be shown at varying heights and in a great many ways.

The turntable has a total loading capacity of 65 lb and the motor is rated at only 12 W. The standard finish is in grey hammered lacquer and the price is £21 15s.



Typical pump in the Sigmund "G" series



Right: Four-in-one turntable (Mechanical Display Features)

Cost of Rural Electricity

Norwegian and American Experience

By C. F. MATTHEWS, B.Sc., A.M.I.E.E.

A REALISTIC appraisal of whether rural and small community electrification is as burdensome as is sometimes made out, cannot ignore overseas experience and statistics. Both Norway and the United States, for instance, can show illuminating facts.

Norway, as is well known, has, at 6,500 kWh per head of population, the highest individual consumption in the world, being twice that of the United States. About 36 per cent of the supply is for domestic purposes or more than four times as much per head as in Great Britain. In fact, about twice as much electricity per head is used in Norway for residential use alone as for all purposes in Britain.

Yet Norway, with 3,343,000 people, is rather larger than Great Britain and Ireland. Except Russia, no other European country can show such great distances. It is as far from the southern tip to the north as it is from this southern point to Rome or to Moscow. Only four Norwegian towns have over 30,000 population, and in the rural areas the people are scattered widely rather than concentrated in villages. Mountainous and torn by fiords, yet 96 per cent of Norway's people are on supply. With all the apparent odds against economic distribution electricity is retailed at an average price of ½d per kWh, divided almost equally between generation costs and distribution costs.

In the United States, 4,300,000 consumers take supply from rural co-operatives operating on capital lent by the Rural Electrification Administration at 3 per cent interest and a 25-year basis for amortisation. After paying these and all other charges, the distributors together show a surplus of $43 million. The revenue gives a return on capital of about 14 per cent. The average price per kWh sold by the undertakings is 2·5 cents which compares with nearly 2·7 cents for the United States as a whole, for all purposes excluding large power.

T.V.A. System

Most enlightening, too, are figures from the distributors in the Tennessee Valley. These distributors are independent but conform to identical methods of accountancy, operate standard T.V.A. retail tariffs, as well as taking bulk supply from the T.V.A. Consequently their figures give a good indication of comparative costs of the types of undertakings involved.

The figures shown are broken down into the costs of the largest town, Memphis; the four largest towns, including Memphis; and co-operatives and other municipalities.

COST OF ELECTRICITY IN THE TENNESSEE VALLEY SYSTEM (1953)

	Consumers	Average Price per kWh (Cents)			
		Residential	Small Light and Power	Large Light and Power	TOTAL
					Cents
Largest Town (Memphis)	145,559	1.85	1.95	0.74	1.16
Four Largest Towns:	384,670	1.24	1.63	0.68	1.0
Other Municipalities: (93)	434,486	1.21	1.45	0.74	1.13
Rural Farmers' Co-Operatives (51)	464,947	1.52	1.91	0.94	1.49
Combined figures Municipalities and Co-Operatives:	1,284,103	1.31	1.59	0.71	1.13

The heavy proportion of farms to other consumers must be noted, and it should be borne in mind that each undertaking carries the cost of separate staffs. It is also relevant to point out that some of the smaller undertakings are below the minimum economic size which, some years ago, a T.V.A. survey put tentatively at 2,000 consumers.

Yet, as will be noted, the average price per kWh for all purposes is slightly lower for the combined undertakings than for the largest town. If the proportion of co-operative consumers was lowered from the present 37 per cent to, say, 20 per cent, the effect would be to reduce the average cost per kWh by about a fiftieth of a cent. If large power and light were ignored, the difference in the average price for total kWh between each category would again be narrow.

As will be seen, large power, while commanding a low kWh price for itself, has not helped other categories. Indeed, the four largest towns with considerable power loads compare unfavourably with other municipalities in the cost of kWh for other purposes. In a system like that of the T.V.A, where tariffs and economic development are both instrumental in increasing energy sold, the difference in retail prices between distributors in terms of cents tends to be small.

Thermal Resistivity of Soil

AN evaluation of two rapid methods of assessing the thermal resistivity of soil was given in a paper presented to the Measurements Section of the Institution of Electrical Engineers on 28th February. The authors were Messrs. M. W. Makowski and K. Mochlinski of the British Electrical and Allied Industries Research Association.

A knowledge of the thermal resistivity of the soil is important in such matters as buried cables, heat pumps and buried pipes containing heated fluids. The value depends on three factors; the composition of the soil, the compactness of the soil, and the moisture content.

The first rapid method described is based on measurements of temperature made during the transient stage of heating by means of a line-source heater known as the transient needle. This is an electrically heated probe containing a temperature measuring element and constructed to closely represent an infinite line-source of heat. Plotting of temperature at a small radius against the logarithm of time indicates the thermal resistivity of the medium by the slope when the graph becomes a straight line. The probe employed has a length not less than 100 times its external diameter. The construction and method of use were described in some detail.

The second rapid method assesses the thermal resistivity from the constitution of the soil, and is applicable so far only to sand-clay mixtures. A sample is taken in such a way that the bulky density and moisture content of the soil are preserved. The dry density, moisture content and relative percentage of clay have then to be determined by analysis.

The nomogram is developed, based on several previously known formulæ, to arrive at the thermal conductivity given the dry density, moisture content and clay content.

Extensive tests have been made with both methods and they have been found quite reliable and practicable for field use, within the wide limits of error regarded as inherent in dealing with soil characteristics.

VIEWS on the NEWS

By REFLECTOR

PROMINENT in the news this week have been the substantial wage increases granted to employees in various sections of the engineering industry. In particular, the National Federated Electrical Association's statement that it had been compelled to agree to an increase of 4d an hour for electricians although it did not consider this justified caught the public attention. I had the opportunity of attending a Press conference at which Mr. L. C. Penwill elaborated his Association's attitude and I was struck by the change in emphasis in wage negotiations. Now the essential thing is to obtain men, and wages are governed by that primary need. Thus, when the Central Electricity Authority gave its operatives an additional 4d an hour, the N.F.E.A. was forced to do likewise. Mr. Penwill said that the industry was " overloaded " and could absorb 20 per cent more labour. At the moment electrical contractors employed five electricians to every one in the employ of the Area Boards and did 80 per cent of the work, but the ratio would soon change if the Boards were able to attract men away by higher wages. It was the considered opinion of the Association, however, that it was against the national interest to give an increase in wages unless this was justified by higher production. Asked to comment on the views expressed by the chairman of the London Electricity Board that mass wage claims in the nationalised industries were too readily met, Mr. Penwill said he personally felt that the arguments put forward were sound. He thought that as the Boards and contractors were competing for the same labour there should be liaison between them in the matter of wages.

* * *

From the long-term point of view, of course, both the shortage of man-power and the cost of installations are of serious consequence to the industry. It is quite obvious that many pre-war installation are becoming unreliable, sometimes dangerous. It is already beyond the means of many people to have their houses rewired and the present increase must aggravate the position. Granted, as Mr. Penwill said, that the contractors themselves are unable to absorb any of the extra wages bill and must pass it on to the public, surely there is sufficient ingenuity in the industry to simplify installations, so reducing the number of man-hours required, and to introduce other economies?

* * *

Last week I referred to the importance to the country of railway electrification. Speaking at a luncheon of the Institution of Locomotive Engineers last week the Minister of Transport, Mr. Harold Watkinson, gave a categorical assurance that " despite the vital need for cutting back some of our capital requirements, neither the locomotive building programme nor the major work under the modernisation plan will be affected." The steam locomotive, he said, no longer fitted in with the pattern of our resources. With this I am in full agreement, and so too I imagine is the Rev. W. Hodgkins, of Southend, who in a recent sermon described the Fenchurch Street line as " an illustration of human wickedness." Mr. Watkinson went on to say that we had to move on first to diesel and then, with increasing speed, to electric traction. He added that he believed we in Britain were on the verge of developments which might have an important bearing on the progress of rail electrification; this I presume referred to the 50 c/s system of traction.

* * *

The perplexing question " When is a scullery not a scullery? " is still causing trouble, says an *Evening Citizen* (Glasgow) reporter. Tenants, he finds, argue that the name should be applied to the place where washing and cooking are done, but the electricity officials say that according to the dictionary a scullery is the place where vegetables and other foods are prepared for cooking and where washing is done. Whatever the rights or wrongs of this, I am surprised that a Scottish paper should lay the blame on the " British Electricity Authority."

* * *

" We should give credit to the electricity supply industry. Our supply costs have gone up 30 per cent since nationalisation. Anything that has only gone up that much in the past six years is worth while." This tribute comes from the C.E.A. which, I should hasten to explain, in this case stands for the Cinema Exhibitors' Association. Speaking at a meeting of the Edinburgh and South East Scotland Branch, Mr. R. McLaughlin reported that efforts to get off-peak charges had been unsuccessful, but, he added, " It is quite safe to say that the item which has gone up least in the cinema field is the electricity charge."

* * *

One of the latest British Railways posters announced that a number of its cross-Channel steamers are now fitted with stabilisers. A much earlier device for the relief of passengers suffering from seasickness was reported by Mr. H. P. Bleckly, of Dover, in a note published in the *Electrical Review* of 2nd March, 1906, under the heading of " Cradle of the Deep Electrified." The apparatus, the invention of a London dentist, was described as follows: —

> " A swinging cot is suspended on gimbals in much the same way as a ship's compass. To the ceiling of the cabin are attached four electric brakes which connect with the four corners of the cot by means of a suitable arrangement of cords and pulleys. When the cot has a tendency to lose its horizontality, one or two of these brakes become active and so check it until the ship has regained an upright position. The ingenious part of the apparatus is the way in which contact is made so as to apply the brakes at the right moment. This is done by means of mercury contained in four tubes, placed at the bottom of the cot in the form of a square. When the cot begins to lose its horizontality, the mercury runs down into one or two corners of the tubes, as the case may be, when it completes the circuit and so operates the brakes at the required points."

TECHNICAL EDUCATION

Five-Year Plan Announced in White Paper

DETAILS of the Government's five-year plan for the advancement of technical education are given in a White Paper "Technical Education" published last week (Cmd. 9703, H.M. Stationery Office, 1s 6d net).

After definitions of technologists, technicians, craftsmen, etc., there follows an introduction in which the present position regarding the supply of technologists in other countries is presented as a challenge to this country. In 1954 this country, with a population of close on 50 million, produced 2,800 university graduates in the engineering and other applied sciences, that is, 57 per million of the population. Some 2,300 of these students obtained their qualifications by three- or four-year full-time study at the universities and the rest by full-time or part-time studies at technical colleges.

In the U.S.A., with a population of 162 million, there are a large number of institutions of university status which train engineers. There were produced from these in 1954 a total of 22,000 engineering graduates, that is 136 per million of the population. This was less than half the output of 52,000 in 1950 when the age groups were larger and the total was swollen by ex-servicemen. The Americans estimate that the number will rise to 43,000 by 1964 following the immediate post-war peak in the birth rate.

With a population of 214 million, the Soviet Union claims to be producing 60,000 "professional engineers" per annum, that is 280 per million of the population. These qualify after courses of 5½ years at specialist institutes where the standard is said to be high.

The present position in schools, technical colleges and universities in England and Wales is then outlined and details are given of the plan proper. The Government proposes to put in hand immediately a five-year programme of development related as closely as can be to the most urgent demands and the extent of available resources. The objectives during this period are to increase by about a half the output of students from advanced courses at technical colleges and as part of a proportionate increase at the lower levels to double the numbers released by their employers for part-time courses during the day. The present annual output from advanced courses at technical colleges in England and Wales, including roughly 1,000 who gained degrees in science and about 500 who gained degrees in technology, is about 9,500. The proportion of these who ultimately become technologists in the sense in which the term is used in the White Paper is not precisely known, but is probably about one half. The Government now proposes to raise the capacity of advanced courses at technical colleges as soon as possible from 9,500 to about 15,000.

As technologies grow more complex the need for versatility increases the strain of reaching these high qualifications by evening work or by studies on one or two days a week. There will be many who will wish or will be obliged to continue to take such part-time courses, but the Government believes that for the highest technological qualification sandwich courses will become more and more appropriate.

Sandwich courses at the highest level will no doubt be eligible for the new award to be given by the National Council of Technological Awards under the chairmanship of Lord Hives. This Council has been set up on the recommendation of the National Advisory Council on Education for Industry and Commerce. At the moment the only national qualification of sufficiently high level for many of the best students attending the colleges is the London University external degree. This suffers from the disadvantages inherent in external control and is limited to a few technologies. It was therefore considered to be unsuitable as a permanent qualification for colleges of advanced technology.

The Government considers that the bulk of full-time or sandwich courses should be carried out in colleges which concentrate on advanced courses of technological level. In 1952 a special rate of 75 per cent grant was introduced to foster the development of technical colleges in which a large proportion of the work would consist of advanced work and research in technology, including courses in advanced technology at graduate and post-graduate levels.

The Government now wishes to see the proportion of advanced work at these colleges vigorously increased, so that as many of them as possible may develop speedily into colleges of advanced technology.

There are at present some 40,000 part-time and about 9,000 full-time teachers in technical colleges. About 9,500 of them are school teachers who teach in technical colleges in the evening.

Full details of the capital expenditure involved in the scheme as a whole are given in the White Paper; overall it is something of the order of £100 million.

Mr. Randall's Letter

When Mr. H. J. Randall, chairman of the London Electricity Board, wrote to *The Times* about a month ago to protest against the facile manner in which a large increase in wages had been granted to workers in the electricity supply industry, he opened up a very wide and significant subject.

The Minister of Fuel and Power has stated that the subject was one that should not have been ventilated in the Press but discussed with him. He deprecated the carrying on of a public dispute between two appointees of his (Mr. Randall and Lord Citrine). While we feel inclined to concur in this view, and while we cannot subscribe to some of Mr. Randall's contentions, we have to admit that in writing the letter he raised a question of national importance. The matter goes far beyond electricity supply: it merely starts there and extends to other nationalised services and eventually affects the whole of industry. We suggested in our issue of 24th February that wage increases in nationalised industries were extorted by threats of stoppages in these vital services. However that may be, if such increases are the immediate cause of a further turn of the inflationary spiral a stand has to be made at some point. This has been emphasised in a number of letters and statements arising out of Mr. Randall's initial arguments, including a supporting leader in *The Times*, and the way has been prepared for stiffer resistance to the demands which are made automatically at almost regular intervals. Thus while not entirely agreeing with Mr. Randall's method of presenting his case, we think that he has done some service to the community.

PERSONAL AND SOCIAL

News of Men and Women of the Industry

The Minister of Fuel and Power has reappointed **Viscount Falmouth,** Companion I.E.E., M.I.Mech.E., of Chelsea, and **Alderman E. Simms,** of Brighton, as part-time members of the South Eastern Electricity Board. **Mr. W. J. Oswald,** A.M.I.E.E., of Wimbledon Park, will retire from the Board on 31st March on completion of his term of office.

The Minister has also appointed **Mr. R. M. Barrow, M.A., J.P.,** of Edgbaston, Birmingham, as a part-time member of the Midlands Electrictiy Board from 1st March. Mr. Barrow was chairman of the Midlands Electricity Consultative Council from October, 1952, until August, 1955.

Mr. L. Smith has been appointed manager of the Manchester branch of Siemens Brothers & Co., Ltd., with headquarters at 92-94, Oxford Road, Manchester, 13.

Fenton, Byrn & Co., Ltd., of Airflow Works, Berrylands Road, Surbiton, announce that **Mr. R. H. Grieve** has been appointed sales manager for the company in addition to his previous duties as manager of the Engineering Services Department of the company.

Mr. W. E. B. Nettleton, M.I.E.E., sub-area engineer, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, has been appointed to succeed **Mr. W. Moody,** M.I.E.E., who is shortly retiring from the position of manager of the Board's No. 5 (Wakefield) Sub-Area.

Mr. W. E. B. Nettleton

Mr. Nettleton received his training with the British Westinghouse Co., and served in the R.F.C. during the 1914-18 war. He held positions as supervising engineer in the Erection Department of Metropolitan-Vickers and e.h.v. engineer with the Salford Corporation Electricity Department and he went to Sheffield in 1938, becoming deputy distribution engineer and, in 1948, chief assistant sub-area engineer.

Mr. Moody was trained at the Phœnix Works, Bradford, and the Dick Kerr Works, Preston, and remained with the English Electric Co., in various positions, until 1928 when he was appointed technical sales engineer to the Yorkshire Electric Power Co., and associated companies, and from 1935 to vesting date was sales manager.

Mr. R. L. C. Tate has joined the Lighting Department of the British Thomson-Houston Co., Ltd., from the staff of the Electric Lamp Manufacturers' Association. Educated at Christ's Hospital, Mr. Tate was a junior member of the Lighting Service Bureau before the war and served in North Africa and Italy with R.E.M.E. during hostilities. He was with the Abell & Smith Electric Co., Ltd., of Worcester, after the war and since 1949 has specialised in shop lighting at the E.L.M.A. Lighting Service Bureau. Mr. Tate has lectured widely on lighting subjects to trade associations, conferences, and summer schools. He was the author of an I.E.S. paper last year on lighting in stores.

Mr. R. L. C. Tate

Mr. R. W. Addie has been appointed assistant commercial manager and **Mr. M. A. E. Butler** technical-commercial manager of the Television and Radio Division of Philips Electrical, Ltd.

Mr. Addie graduated from Cambridge in 1939 with a degree in engineering and after war service he joined the Technical-Commercial Department of Philips in 1946, being made manager five years later. In his new post he will act as deputy to Mr. A. L. Sutherland, director in charge of television and radio.

Mr. Butler was educated at Oxford and holds an honours degree in physics and a degree in mathematics. After serving as an R.A.F. signals officer in the United Kingdom and India, he joined the staff of Standard Telephones & Cables, Ltd., where he was employed in the research laboratories. In 1951 he joined the Technical-Commercial Department of Philips as an engineer.

Mr. R. W. Addie

Mr. M. A. E. Butler

The Worshipful Company of Tinplate Workers alias Wire Workers of the City of London announces that the first place in the essay competition amongst those awarded travelling scholarships in 1955, has been gained by **Mr. Brian Pounder,** who is employed by Enfield Rolling Mills, Brimsdown, Enfield, and was presented by the Cold Rolled Brass and Copper Association and sent to Yarrow & Co., Ltd., Scotstoun, Glasgow, for his tour. The second place goes to **Mr. Paul M. M. Boucher** (Metropolitan-Vickers, Ltd., Manchester), presented by B.E.A.M.A., who made his tour with I.C.I. Metals, Ltd., Witton, Birmingham. The award of third place is given to **Mr. Alan Waites** (Yorkshire Copper Works, Ltd., Leeds), presented by the Brass and Copper Tube Association, who made his tour with Richard Thomas & Baldwins, Ltd., at Ebbw Vale. Mr. H. S. Pocock and Mr. P. L. Garrett acted as assessors.

Mr. Stanley F. Steward, C.B.E., who joined Lancashire Dynamo Holdings, Ltd., on 1st January as group managing director, has been elected a director and succeeds Mr. H. W. Bosworth as chairman of Lancashire Dynamo & Crypto, Ltd., a subsidiary of the holdings company. **Mr. A. W. A. Dick-Cleland,** M.I.E.E., and **Mr. D. C. Lorkin,** F.C.I.S., continue as joint managing directors of Lancashire Dynamo & Crypto, Ltd.

Mr. S. F. Steward

The **E.I.B.A. Berks, Bucks and Oxon Branch** are holding their annual ball on Friday, 16th March, at the Olympia Ballroom, Reading, from 8 p.m. to 2 a.m. Tickets (12s 6d double, 7s 6d single) may be obtained from Mr. L. H. Waters, c/o Southern Electricity Board, 3-5, Market Place, Reading.

Mr. E. S. Prior is retiring from the position of district manager, Castleford, Yorkshire Electricity Board, and will be succeeded by **Mr. A. Watson,** A.M.I.E.E., A.M.C.T. Mr. Prior started with the former Yorkshire Electric Power Co. in 1911 and held various engineering appointments in the company's districts at Goole, Castleford, Staincross and Tadcaster

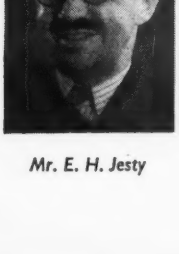
until 1948 when he was appointed district manager at Castleford.

Mr. Watson served his apprenticeship with Metropolitan-Vickers and after war service (1917-19) as a pilot in the R.F.C. and R.A.F. he joined the Bury Corporation Electricity Department and later held various positions with the Tamworth & District Electric Supply Co. and the Hackney Electricity Department before becoming deputy to the borough electrical engineer at Aberystwyth in 1938. During the last war he served with the Air Ministry of Works Directorate as assistant mechanical and electrical engineer and in 1945 was appointed borough electrical engineer of Darwen. Since nationalisation he has been power sales engineer, No. 2 Sub-Area, North Western Electricity Board.

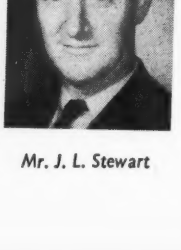
Mr. B. G. Scott, B.Eng., A.M.I.E.E., who joined Lancashire Dynamo & Crypto, Ltd., as sales engineer in 1945, has been appointed London sales manager. Mr. Scott graduated at Liverpool University and began his career with the General Electric Co., Ltd. Subsequently he was with the B.B.C. and during the war was electrical manager at a gunpowder factory. As sales engineer with L.D.C., Mr. Scott has represented the company in various districts of the London area, concentrating particularly on the oil and marine market. In his new appointment he will continue his interest in these fields. **Mr. V. W. Press,** who preceded Mr. Scott in London, is now sales and contracts manager of Lancashire Dynamo Switchgear, Ltd., an associated company, operating from their new works at Oxted, Surrey.

Mr. B. G. Scott

Mr. E. H. Jesty, A.M.I.E.E., who is co-author with **Mr. J. L. Stewart,** B.A., of the article on "Load Curve Analysis" appearing in this issue, studied engineering at the Merchant Venturers' Technical College at Bristol and spent some time in the workshops and contracting section of King & Co., Western Electrical Works, Bristol. He entered the supply industry in 1922 in the mains department of the former London Electric Supply Corporation, Ltd., and after vesting day he joined the staff of the chief engineer of the London Electricity Board. Mr. Jesty is a member of the Société des Ingénieurs Civils de France and a past chairman of the Chief Technical Assistants' Association.



Mr. E. H. Jesty



Mr. J. L. Stewart

Mr. Stewart was educated at St. Olave's Grammar School, S.E.1, the London School of Economics and King's College, London, where he graduated with honours in French. In 1951 he was Philip's prize-winner in the examinations of the Association of Incorporated Statisticians. From 1930 to 1941 he was in the Economics and Statistics Section of the Central Electricity Board and, following service in the Royal Navy in Coastal Forces, spent three years in the Planning Division of the Ministry of Works. He joined the Chief Engineer's Department of the London Electricity Board in 1949.

Directors of Claude-General Neon Lights, Ltd., met on 8th February to say farewell to **Captain Clifford Higgins,** who has retired from the company after serving for 25 years as its chief engineer. Capt. Higgins joined the Osram-G.E.C. Lamp Works on leaving the Army in 1919. He was in charge of the production of gas-filled lamps until 1925 and subsequently of the Osram Lamp Engineering Department. He was largely responsible for the planning and installation of plant at the No. 7 lamp factory on the G.E.C.'s East Lane estate, Wembley. On joining Claude-General Neon Lights, Ltd., as chief engineer in 1930, his first task was to organise production at the company's Wembley Works, which was then about to open, and he remained there as chief engineer until this year. He will continue to retain his chairmanship of various sub-committees of the British Standards Institution, and will undertake consultancy work.

Capt. Clifford Higgins (right) talking, during his farewell party, to Mr. S. Dickson Moyse, managing director of Claude-General Neon Lights, Ltd.

On 24th February long-service presentations were made to 16 members of the staff at Brimsdown of **Enfield Cables, Ltd.** Mr. J. E. Sunderland, director and general manager of the company, presented the certificates and awards. Mr. C. T. W. Sutton responded on behalf of the recipients and Mr. A. R. Thomas, chairman of the Long Service Association, also spoke. About 280 people attended the function and after the presentations the evening concluded with a cabaret and floor show.

The Midlands Area final of the **E.I.B.A. National Golf Championship** will take place at Edgbaston Golf Club, Birmingham, on 6th June next. An evening meal for presentation of prizes will be arranged, and other meals will be available during the day.

Mr. C. F. Matthews, B.Sc., A.M.I.E.E., whose article "Cost of Rural Electricity" appears in this issue is a graduate of the University of Wales and is technical engineer in the Newbury Sub-Area of the Southern Electricity Board. Up to 1935 he was deputy to the Chorley district manager, Lancashire Electric Power Co. and he was subsequently senior technical assistant with the Mid-Southern Utility Co. and assistant to the chief engineer of the Wessex Electricity Co.

Mr. C. F. Matthews

Mr. Matthews has made a special study of resource development as exemplified by the Tennessee Valley Authority and his knowledge of this subject was drawn upon by the Welsh Advisory Council in the preparation of its 1944 report which recommended the adoption of T.V.A. methods in Wales.

The next luncheon of the **Electrical Industries Club** will be held on Tuesday next (13th March) at the Connaught Rooms, Great Queen Street, W.C.2 (12.30 for 1 p.m.), when the guest speaker will be Mr. D. D. Walker, managing director of Evershed & Vignoles, Ltd.

The eighth annual dinner and cabaret of the Staff Association of the **Telegraph Construction & Maintenance Co., Ltd.,** and **Submarine Cables, Ltd.,** was held at the Dorchester Hotel, London, on 29th February, and was attended by nearly 350 members and their friends. Mr. W. R. Martin, personnel manager and chairman of the Council, presided, and Mr. J. N. Dean, chairman of Telcon, replied to the toast to the company. Other directors were Mr. W. F. Randall, managing director of the Telcon metals group, and Mr. B. H. Musgrave, Dr. E. W. Smith, Mr. J. Innes, C.B., and Mr. W. Glass.

The Annual Ladies' Night of the **Ipswich and District Electrical Association** took place on 24th February at the Red Lion Hotel, Colchester. Despite adverse weather conditions,

Mr. S. Hardy, chairman of the Ipswich and District Electrical Association, Mrs.Hardy and their daughter Ann (on left), welcoming Mr. and Mrs. R. S. Winter, at the reception

the function was attended by approximately 200 people, including prominent members of the electrical industry from places as far afield as Birmingham and London, and an enjoyable evening was spent.

Mr. James B. Hood, district engineer with the North Eastern Electricity Board, is to be the next Mayor of Richmond, Yorks.

OBITUARY

Prof. W. H. Keeson, the well-known physicist, died recently at Leyden, Holland, at the age of seventy-nine. He did much valuable work in the field of very low temperatures and in 1926 he succeeded in solidifying helium for the first time. This was followed by the scientifically more important discovery of the second phase of liquifying the gas and the phenomenon of super-conductivity.

Mr. W. V. Waite.—The death occurred on 31st March, at the age of seventy-nine, of Mr. William Vincent Waite, O.B.E., M.I.Mech.E., A.M.I.E.E. During the last war he was Assistant Director, Fighting Vehicles Production.

Mr. Charles Edward Hume, manager of the former Ramsgate & District Electric Supply Co., who retired in 1928, has died, aged ninety.

USKMOUTH EXPLOSION

Verdicts of "Accidental death" were recorded at the inquest on 1st March on Denis Aubrey Barrett (29), turbine driver, and Montague Henry Payne (33), labourer, who were fatally injured when an explosion occurred at Uskmouth power station on 18th January. An engineer who inadvertently switched off a motor on a generator at the power station just before the explosion was exonerated from blame, the coroner saying that there was no evidence to show that the mistake caused the explosion.

Mr. W. L. Williams, power station superintendent, said that the turbine had started running last November. They had tried to get it working before that, but found that it had excessive vibration and some parts were sent back to the manufacturers. After is was started again there were small troubles expected at the beginning of a turbine's working life, but on 9th December, when the final adjustments were made, everything was in order. From then until the explosion the turbine had worked continuously and perfectly.

NEW E.D.A. FILM

The latest film produced by the British Electrical Development Association should be of great interest to garden lovers and, being in Technicolor, it will also probably rank as one of the most artistic. The setting is Hurtmore Farmhouse, near Godalming, Surrey, now the home of Roy Hay, gardener, writer and broadcaster, and it tells the story of how, after years of neglect, the garden is transformed by the use of electricity.

Starting with the installation of soil warming cables in frames, the film then reveals the advantages of tubular heaters, combined with thermostats, for the greenhouse, ventilating fans for the summer and soil sterilisers. The use of electrically operated lawnmowers, hedge trimmers, rotary hoes, etc., is also demonstrated.

Running time is 20 minutes and the film is available in 35 mm and 16 mm sizes. It was produced by Oswald Skilback and directed by Seafield Head in association with the Film Producers Guild.

E.D.A. has also produced the third in their series of "talkiestrips" for use in the training of sales staffs of electricity service centres. Starting in humorous vein it reveals the secret of how to sell a refrigerator to an eskimo and thereafter deals seriously with the features of an electric cooker. The commentary is by Mr. J. A. Stedman of E.D.A. and the drawings are by Bob Godfrey and Geoff Hale.

ILLUMINATION DESIGN COURSE

In our last issue we referred to an illumination design course which the E.L.M.A. Lighting Service Bureau is holding at 2, Savoy Hill, London, W.C.2, from 26th to 28th March, in which we stated that the course of lectures was to be given to the Association of Master Bakers. This was incorrect; the course is one of the Bureau's usual series of illumination design courses.

Restrictive Trade Practices

In a joint statement on the Restrictive Trade Practices Bill last Monday the Federation of British Industries, the National Union of Manufacturers and the Association of British Chambers of Commerce said that they had never believed that restrictive practices were either always in the public interest or always to its detriment. Very often the judgment must depend on striking a balance between good and bad effects. But this was not what the Bill provided. It instructed the court to presume the agreement to be against the public interest unless it passed certain limited tests. The burden of showing justification for an agreement was placed on the parties to it. This might be reasonable if they were able to produce all relevant arguments to support their case. The Bill, however, did not permit this.

The organisations welcomed the judicial character of the court but the F.B.I. and the N.U.M. regretted the appointment of nine lay members and said it would be better to appoint a larger number to form a panel from which assessors, not members, could be selected on a part-time basis to help the judge.

The classes of agreements to be examined by the court were to be registered. Much more definition was required, however, if the register was not to be clogged with paper describing agreements that no stretch of the imagination could call restrictive.

The Bill did not clearly define the Registrar's constitutional status or his role in relation to the court. Yet he was given wide powers, including even in some circumstances the right of entry and search without any court order.

While the collective enforcement of resale price maintenance was banned outright the individual supplier of goods was given enhanced rights to enforce his own prices. This, however valuable to the larger concerns, might well prove of little advantage to the smaller ones whose resources would often be inadequate to exercise their rights, except by some form of collective enforcement. Some compromise solution should be found short of total prohibition of collective enforcement.

Financial Section

STOCKS and SHARES

THE accompanying table of shares, prices and yields reappears after an absence of six weeks. In that time, Stock Exchange markets have had a singularly rough handling by events, the effect of which can be judged from the column recording the extent to which prices have changed since mid-January. This period covers, of course, the increase in Bank Rate to 5½ per cent and the stiffening of the supporting measures designed to reinforce the Government's campaign against inflation. Gilt-edged stocks fell heavily in advance of these events, which, however, served, temporarily, to put new heart into the market. Industrials staged something of a rally, but continued to look distinctly uneasy in the face of accumulating evidence of the effectiveness of the Government's squeezing tactics.

A.E.I. Issue

Dealings started early this week in the new issue by Associated Electrical Industries, who are raising over £23¾ million fresh capital by an offer, to stockholders and employees, of new £1 ordinary shares at 57s 6d each. First transactions took place at premiums of about 1s. As already announced, the proceeds of the issue are to be used mainly in adding to the group's productive capacity, which the board expect to be proved inadequate by at least a doubling of the demand for electrical equipment over the coming decade. In the absence of a marked change in trading conditions, they anticipate the maintenance of the dividend on the ordinary capital at the present rate of 15 per cent. There is thus a prospective yield of fully 5 per cent for a buyer of the new shares at an all-in price of 58s 6d.

Other New Issues

The general condition of the industrial market, coupled with the new measures affecting the radio trade, have made difficult weather for the rights issues of new ordinary shares by the Decca and Plessey companies. In both cases, however, the offers are made on terms sufficiently attractive to assure the maintenance of substantial premiums on the prices at which the shares are offered to shareholders. On Decca's new 4s "A" shares, offered at 17s 6d, the premium has recently been around 8s, at which level they show the buyer a prospective yield of over 6½ per cent on the rate of dividend indicated by the company after the increase in the capital. On a similar basis, the Plessey new 10s shares offer a return of 5¼ per cent, having been quoted at a premium of 7s 9d on the issue price of 50s. In both cases the shares are at present transferable free of the usual 2 per cent stamp duty.

Price Changes

So comprehensive has been the fall in industrial share prices over the past

Price Changes in

Company or Board	Nom. Value	Middle price 5th Mar.	Seven Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1955 Highest	1955 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	77½	−1	3	3	3 17 6	94⅜	76½
Brit. Elec. 1974/77	100	76	−1½	3	3	3 19 0	93⅛	75½
Brit. Elec. 1976/79	100	81½		3½	3½	4 6 0	98⅜	80½
Brit. Elec. 1974/79	100	89½	−4	4½	4½	4 15 0	109	90½
Overseas Electric Supply								
Calcutta Elec.	£1	19/3	−1/3	6†	6†	6 4 9†	22/6	20/9
East African Power	£1	21/-		7	7	6 13 3	24/6	19/9
Nigerian Elec.	£1	19/9	−1/9	10	10	10 2 6	27/-	21/-
Palestine Elec. "A"	£1	21/-		Nil	Nil	Nil	22/9	21/-
Perak Hydro-Elec.	£1	15/9	−1/9	10	10	—	22/3	17/9
Equipment and Manufacturing								
Aberdare Cables	5/-	10/9	−1/3	12½	17½	8 2 9	14/6	11/-
Aerialite	1/-	5/9	−6d	88⅛	45*	7 16 6	6/9	5/3
Allen, W. H.	£1	69/-	−8/-	20	20	5 16 0	83/9	74/6
Aron Elec. Ord.	£1	54/3	−1/3	15	15	5 10 6	63/9	55/6
Assd. Automation	10/-	27/-	−7/-	10	10	3 14 0	32/-	11/-
Assoc. Elec. Ord.	£1	59/6x.r.		14	15	5 0 6	96/-	62/6
Automatic Tel. & El.	£1	61/3	−10/-	15	15*	4 18 0	79/6	60/-
Babcock & Wilcox	£1	65/9	−15/6	12*	15	4 12 0	98/-	68/6
Baldwin, H.	2/-	4/-	−9d	20	20	10 0 0	5/6	4/4
Bakelite	10/-	29/-	−4/6	16	16	5 5 0	34/6	27/-
British Aluminium	£1	43/-	−4/6	10	12	5 11 6	58/-	35/3
B.I. Callender's	£1	47/6	−4/6	10	12½‡	5 5 3	55/3	44/9
B.I. Callender's 6% Pref.	£1	21/9	−9d	6	6	5 10 3	26/6	21/9
British Thermostat	5/-	26/3	−5/-	27½	27½	5 4 9	35/-	22/6
British Vac. Cleaner	5/-	7/6	−1/-	25	30	—	10/-	6/6
Brook Motors	10/-	39/6	−3/6	20	25	6 6 6	47/-	39/9
Brush Ord.	5/-	6/6	−1/-	6	10	7 13 9	9/6	7/6
Bulgin, A. F.	1/-	6/6	−6d	30	45	6 18 6	8/-	4/-
Burco Dean	5/-	9/-	−3/6	—	22½	12 10 0	17/3	12/-
Chloride El. Storage	£1	62/6	−5/9	12½	17½	5 12 0	77/6	58/6
Clarke Chapman	£1	93/9	−2/6	20	22½	4 16 0	102/6	68/9
Cole, E. K.	5/-	17/-	−2/9	27½	17½*	5 3 0	25/6	18/3
Cossor, A. C.	5/-	7/-	−2/-	10	15	10 14 6	14/-	8/9
Crabtree	10/-	27/3	−1/9	20	20	7 6 9	34/6	27/6
Crompton Parkinson Ord.	5/-	13/3	−1/9	20	16*	6 3 0	19/9	15/-
De La Rue	5/-	17/9	−1/-	20	30	8 9 0	26/-	17/-
Decca	4/-	26/6 x.r.		56½	43¾*	6 12 0	48/9	31/-
Desoutter	5/-	26/6	−6/-	25	30	5 13 3	35/-	25/6
Dewhurst	2/-	11/6	−6d	24	30	5 4 3	11/3	7/3
Dictograph Tel.	2/-	6/-	−1/-	20	20	6 13 3	9/3	9/6
Dubilier Condenser	1/-	4/-	−6d	25	25*	6 5 0	5/7	3/1
E.M.I.	10	28/9	−4/-	10	15	5 4 3	37/-	25/3
Electrical Components	5/-	13/9	−1/3	20	25	9 1 9	21/3	13/9
Elec. Construction	£1	26/3	−2/6*	15	8½	6 9 6	41/3	28/9
Enfield Cable Ord.	£1	15/3	−3/9	Nil	Nil	Nil	25/3	18/6
English Electric	£1	49/9	−11/6	12½	12½	5 0 6	86/9	54/3
English Electric 3¾% Pref.	£1	13/9	−3d	3¾	3¾	5 9 0	16/9	14/-
Ericsson Tel.	5/-	35/-	−5/-	25†	25*†	3 11 6†	46/6	29/-
Ever Ready	5/-	26/-	−4/9	40	35*	6 14 6	38/-	22/3
Falk Stadelmann	£1	37/-	−8/-	15	17½	9 9 3	52/6	42/-
G.E.C. Ord.	£1	51/9	−8/9	12½	14	5 8 3	80/3	51/3
G.E.C. 6½% Pref.	£1	22/9	−1/-	6½	6½	5 14 3	28/4	23/6
General Cables	5/-	13/-	−3/3	30	30	11 10 9	17/-	15/-
Greenwood & Batley	£1	46/3	−1/3	17½	17½	7 11 3	57/6	45/-
Hackbridge Cable	5/-	19/6	−4/9	20	25	6 8 3	23/9	14/-
Hackbridge & Hewittic	5/-	19/-	−2/3	25	30	—	24/9	17/-
Heatrae	2/-	4/9	−3d	12½	15	6 6 3	5/9	4/3
Henley's	10/-	15/9	−1/-	10½	10½	6 17 3	21/3	15/9
Holophane	5/-	16/9	−2/-	25	30	8 19 3	19/9	16/-

* After scrip issue. † Free of income tax. ‡ Dividend forecast.

month or two that comment on price changes in individual shares might appear invidious. It may, however, be noted that the size of A.E.I.'s new issue of ordinary shares seemed to weigh particularly heavily on the leaders in the electrical equipment market, and that the Government's latest measures were interpreted as being especially unfavourable to investments concerned with some of the "consumer" sides of industry. The relatively modest depreciation in the British Electricity stocks also calls for attention. In our tables, share prices are taken on this occasion from the market, instead of from the usual source of the Stock Exchange Official List, which has lately been appearing only in a truncated form.

Electrical Investments

Company or Board	Nom. Value	Middle price 5th Mar.	Seven Weeks' Rise or Fall	Dividend Previous	Dividend Last	Yield %	1955 Highest	1955 Lowest
Equipment and Manufacturing—continued						£ s d		
Hoover	5/-	25/-	−13/-	70	50	10 0 0	52/6	35/6
I.C.I.	£1	43/6	−2/9	15	10*	4 12 0	61/9	38/3
Intl. Combustion	5/-	17/-	−1/-	25	20*	5 17 9	24/6	16/-
Johnson & Phillips	£1	39/6	−2/6	15	15	7 12 0	52/6	39/6
Lancashire Dynamo	£1	42/6	−5/-	14	15	—	56/5	37/3
Laurence, Scott	5/-	14/6	−1/9	20	12½*	4 6 3	19/6	14/6
Lister, R. A.	£1	29/6	−4/9	9·3	10	6 15 6	40/-	28/9
London Elec. Wire	£1	48/6	−2/9	10	12½	5 3 0	61/3	50/6
Lucas, J.	£1	32/-	−5/6	7½	7½	4 13 9	56/6	38/9
Marryat & Scott	2/-	9/3	−2/-	25	30	6 9 9	13/-	9/6
Mather & Platt	£1	55/9	−8/9	13·4*	15	5 7 6	75/-	48/-
Metal Industries	£1	18/3	−7/6	9	9	—	38/-	25/-
Midland Elec. Mfg.	£1	47/-	−6d	10	12½	5 6 6	55/-	44/-
Morphy-Richards	4/-	23/-	−2/3	35	50	8 14 0	35/-	27/-
Murex	£1	62/3	−3/6	15	20	6 8 6	67/6	49/3
Newman Ind.	2/-	2/6	−3d	10	10	8 0 0	3/6	2/4
Oldham & Son	1/-	2/6	−3d	17½	20	—	3/6	2/1
Parnall (Yate)	5/-	6/6	−1/6	8	14	10 15 3	13/2	7/3
Parsons, C. A.	£1	64/6	−12/-	7½	10	3 2 0	100/-	56/-
Plessey	10/-	57/- x.r.		27½	30†	5 5 3	89/-	55/-
Pye "A" Deferred	5/-	16/-	−2/9	20	12½*	3 18 3	32/9	14/3
Revo	10/-	9/3	−2/3	9	9	9 14 6	15/6	12/6
Reyrolle	£1	84/6	−15/6	13¾	15	3 11 0	127/6	89/-
Rheostatic	4/-	12/9	+3d	20	22½	—	14/3	9/3
Richardsons Westgarth	5/-	14/6	−1/6	15	16⅔	5 15 0	19/-	11/-
Scottish Cables	4/-	16/6	−3d	27½	27½	6 13 3	22/6	16/3
Smith (England), S.	4/-	11/9	−1/9	17½	17½	5 19 3	20/-	14/9
Southern Areas	£1	22/-	−5/6	7½	10	9 1 9	38/-	27/6
Strand Elec.	5/-	7/3	−1/-	17½	15*	10 6 9	13/3	7/6
Sturtevant	5/-	26/6	−3/6	18·9	14·4*†	2 14 6†	35/9	21/-
Sun Elec.	£1	34/6	−1/9	15	20	11 12 0	35/-	33/9
Switchgear & Cowans	5/-	16/3	−6d	10	20	6 3 0	17/-	11/-
Taylor Tunnicliff	5/-	11/6	−2/3	15	15	6 10 6	16/3	11/3
T.C.C.	10/-	42/6	−1/3	25	25	5 17 9	53/9	41/-
T.C. & M.	£1	28/6	−2/9	8½	8½	5 19 3	40/9	29/3
Telephone Mfg.	5/-	6/6	−1/9	10	10	7 13 9	11/6	7/9
Thorn Elec.	5/-	16/9	−2/9	20	15*	4 9 6	33/-	13/9
Thornycroft	£1	43/6	−5/3	15	15*	6 18 0	48/9	34/6
Tube Investments	£1	58/6	−6/6	22½	14*†	4 15 9	62/6	55/-
Vactric	5/-	18/6	+1/-	10	15*	4 1 0	22/-	12/-
Veritys	5/-	7/-	−1/6	12½	12½	8 18 6	12/2	7/-
Walsall Conduits	4/-	11/6	−2/-	70	70	—	17/3	12/-
Ward & Goldstone	5/-	33/-	−4/-	50	30*	4 11 0	45/-	32/6
Watford	2/-	6/9	−9d	22½	25	—	8/9	6/3
Westinghouse Brake	£1	74/-	−6/-	18	18	4 17 3	110/-	82/-
West, Allen	5/-	13/-	−9d	17½	15*	5 15 6	16/6	8/-
Wolf Electric	5/-	20/6	−5/9	17½	20	4 17 6	26/3	16/1
Trusts, Transport and Communications								
Anglo-Am. Tel.:								
A. Ord.	100	79½	−7	6	6	7 11 0	88	67½
Ord.	100	50½	+5½	3¾	3¾	7 8 6	54½	45
Anglo-Portuguese	£1	21/9	−3d	8	8	7 7 3	27/-	21/-
Brit. Elec. Traction:								
Def. Ord.	5/-	17/-	−2/-	50	22½*	6 12 3	24/3	19/-
Cable & Wireless:								
Ord.	£1	39/-	−4/-	10	10	5 2 6	54/-	39/6
4% Loan	100	90	−2½	4	4	4 9 0	100	92/-
Calcutta Trams	£1	24/3	−3d	6†	7½†	6 3 9†	26/9	20/-
Cape Elec. Trams	£1	20/6	+1/9	5½	7½	7 6 3	19/6	16/6
Marconi Marine	£1	31/3	−1/3	10	10	6 8 0	41/3	31/3
Oriental Tel. Ord.	1/-	83/-	−4/6	16	—	—	102/6	72/6
Telephone Rentals	5/-	10/6	−1/-	10	12½	5 19 0	13/6	9/6

Domestic Equipment

Investments connected with domestic electrical appliances, radio, television and rental business, have been unavoidably among the principal casualties under last month's new Government measures, with their requirement of higher deposits on hire-purchase transactions, and of nine-months' instalments in advance for rented equipment. Reports of contracting business in these industries affected the market concerned, which learned also of the Hoover Company's decision to make in the final dividend for 1955 a cut larger than had been intended a month or two earlier. This brings down the payment for the year from 70 to 50 per cent. In an interim report, Morphy-Richards tell shareholders of substantially higher sales, and an improvement in net profits, during the six months to December, but find it difficult to forecast the trend in the second half of the year.

"Magicoal" Introduction

The electrical equipment market welcomes to its lists the introduction of a well-known name through the marketing of the shares of Berry's Electric Magicoal, Ltd. Particulars were published last Monday as a preliminary to the beginning of dealings yesterday (Thursday). Capital of the company consists of £175,000 in 6½ per cent £1 preference shares and £200,000 in 800,000 ordinary shares of 5s. The greater part of the former are being placed at about par, and some 200,000 of the 5s ordinary at 5s 7½d. In the published statement, profits for the year ending this month were expected at least to equal the previous figure of £132,000, and a future ordinary dividend of 10 per cent was forecast.

Brush Dividend

Results for 1955 published by the Brush Group were in line with expectations and caused little further change in the price of the 5s shares. At 6s 6d they showed a yield of rather more than 7½ per cent on the dividend, which is being brought up to the same rate of 10 per cent as before. The increase of a million in group sales at £22·1 million for the year was slightly more than balanced by the rise in costs. Among other company news are the announcements of unchanged dividends from Taylor Tunnicliff and Bakelite, profits in each case being at about the level of the previous year, and from Telegraph Condenser, whose report of a further expansion of earnings has made a good impression on the market.

REPORTS and DIVIDENDS

The Brush Group, Ltd., reports that group sales rose from £21,054,069 in 1954 to £22,094,389 last year, but with costs over £1,000,000 higher at £19,754,430, and higher interest charges, the profit at £1,123,346 is £100,000 lower. After deducting taxation of £643,510, the net balance is £479,836 (against £530,032). It is proposed to pay an unchanged final dividend of 7 per cent, making 10 per cent for the year (unchanged). The net cost of the dividend is higher, the ordinary capital having been increased by preference conversions. The balance carried forward is £321,663 (against £333,509 brought in).

Clarke, Chapman & Co., Ltd.—The trading profit for 1955, including estimated profits to date on contracts approaching completion, is £1,399,832, as compared with £769,327 for 1954. From this is deducted taxation of £478,114 and development expenditure of subsidiaries £30,000, leaving a net balance of £695,546 (against £395,212). Reserves receive £450,000. It is proposed to pay a dividend for the year of 22½ per cent (against 20 per cent).

Broadcast Relay Service, Ltd., announces that 1,709,933 of the 1,928,116 5s ordinary shares offered at 14s each to ordinary stockholders have been taken up. This left 218,183 ordinary shares available for issue as excess shares, for which applications were received for 224,540 shares. Applications for 10,000 shares or less have been allotted in full, and an application for more than 10,000 shares has been scaled down.

Brown Brothers, Ltd.—The group profit for 1955, after meeting all charges, including £505,374 for taxation, is £431,717, as compared with £309,103 for the preceding year. It is proposed to pay a final ordinary dividend of 10 per cent, making the equivalent of 11⅓ per cent for the year on £1,961,280 capital. For 1954 the final dividend on ordinary capital of £1,307,520 was 12½ per cent, making 15 per cent for the year. The 1955 interim dividend of 2½ per cent was paid before the 50 per cent scrip issue.

Morphy - Richards, Ltd., have announced an interim dividend of 20 per cent (same) on larger capital of £259,490. The directors state that sales for the half-year to 31st December last were substantially higher than in the corresponding period of 1954. This has enabled the company to absorb continually rising costs and still show a net increase in profits for the period. It is difficult to forecast with any accuracy the course of trading in the second half-year to 30th June next. They are combating the effect of a completely new purchase tax on electric irons and toasters, two of their principal products, and the "credit squeeze" affects many of their important buyers.

Berry's Electric Magicoal, Ltd.—Particulars of this company were advertised on Monday last in connection with the London marketing of its share capital, reference to which was made in our last week's issue. The company was incorporated on 24th February last as a private company to acquire the issued capital of Berry's Electric, Ltd., and was converted into a public company on 29th February. Berry's Electric, Ltd., the operating company, was incorporated in 1928 to take over the business founded in 1897 by the late Mr. H. H. Berry, the father of the present chairman.

Bruce Peebles & Co., Ltd.—The net profit for 1955 is £215,098, as compared with £203,700 for 1954. Taxation absorbed £231,000. General reserve receives £180,000 and it is proposed to pay a dividend for the year of 25 per cent (including a bonus of 10 per cent), tax free. A similar distribution was made for the previous year. The participating dividend on the 7½ per cent preference capital is maintained at 2½ per cent.

J. H. Fenner & Co. (Holdings), Ltd., has received the consent of the Treasury to the capitalisation of £125,000 of the general reserve for the purpose of paying up in full 500,000 new ordinary shares which will be issued to holders of ordinary shares in the ratio of one new share for every three held.

Bakelite, Ltd.—The group profits for 1955, including special credit of £21,000, is £645,725, as compared with £648,829 for the previous year. Taxation requires £258,400 and the net profit is £357,325 (£320,702). The ordinary dividend for the year is maintained at 16 per cent by a final payment of 11 per cent.

Associated Electrical Industries, Ltd.—At an extraordinary meeting held on 2nd March a resolution was passed increasing the capital from £35 million to £45 million.

The British Oxygen Co., Ltd.—The group trading profits of the parent company for nine months and of the subsidiary companies for the twelve months ended 30th September last are £4,277,152. This compares with £4,168,369 adjusted to a period corresponding to the current results and with £4,736,856 for 1954. Taxation requires £2,209,972, and the net balance for the period is £1,764,673 (£2,008,079 for 1954). It is proposed to pay a final ordinary dividend of 9 per cent on capital as increased by a two-for-five rights issue at 50s per £1 share. An interim dividend of 6 per cent was paid on the smaller capital. The total dividend for 1954 was 15 per cent.

The directors propose to make a one-for-two scrip issue by capitalising £5,682,389 of share premium account and to raise the authorised capital from £15 million to £25 million. Of the additional £1 shares created, 4,547,166 are required in connection with the proposed scrip issue, leaving a balance of 5,452,834 shares unissued.

Heenan Group, Ltd., has declared an interim dividend of 5 per cent (unchanged).

New Companies

A.E.I.-John Thompson Nuclear Energy Co., Ltd.—Registered 22nd February. Capital £1,000,000. To design, develop, manufacture and supply nuclear reactors and components of all types, etc. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

T.V.F.M. Co., Ltd.—Registered 3rd February. Capital £2,000. Designers, manufacturers of and dealers in radio, television, electrical, electronic and telephone apparatus, etc. Directors: R. S. Howells and Mrs. Betty Howells. Regd. office: Lynton, Landseer Road, Southwell, Notts.

R. H. Foster, Ltd.—Registered 13th February. Capital £10,000. Electrical contractors, manufacturers of and dealers in electrical goods, etc. Directors: H. Foster and Y. Rogers. Regd. office: 16, Essex Road, Basingstoke, Hants.

Vigilant Switchgear, Ltd.—Registered 8th February. Capital £1,000. Manufacturers, maintainers and repairers of and wholesale and retail dealers in electric switches, electric bulbs and lamps, radiators, etc. Directors: E. A. Reynolds and I. P. Windle. Regd. office: 117, Hagley Road, Edgbaston, Birmingham, 16.

Liquidations

China & Japan Telephone & Electric Co., Ltd.—Particulars of claims by 23rd March to the liquidator, Mr. A. W. Sarson, 5, London Wall Buildings, London, E.C.2.

G.B.M. (Electrical) Birmingham, Ltd.—Meeting 28th March at 16, Waterloo Road, Wolverhampton, to receive an account of the winding-up by the liquidator, Mr. G. J. Simmons.

Bankruptcies

H. Stansfield, lately carrying on business at 7, Station Road, Ossett, Yorks, as an electrician, now journeyman electrician.—Last day for receiving proofs for dividend 10th March. Trustee, Mr. W. H. Meredith, 20, North Parade, Bradford, Official Receiver.

H. J. Couzens, Canton Works, 165, Young Street, Sheffield, electrical contractor.—Last day for receiving proofs for dividend 14th March. Trustee, Mr. K. A. Miller, 55, Queen Street, Sheffield, Official Receiver.

INDUSTRIAL NEWS

Electricians' Pay Increase

The National Federated Electrical Association has announced that by agreement with the Electrical Trades Union it has decided to award an increase of 4d an hour to operate from 26th March, following the Union's claim for 6d an hour.

The Association rejected the grounds of the claim—increased production, higher income of the industry, the industry's profits, and increased living costs. In a statement giving details of the award, the Association said that after careful consideration of the claim and examination of the arguments used by the E.T.U. and the statistics put forward in support, the Association came to the conclusion that there was no justification for an increase based upon one or all of the grounds upon which the claim was submitted. It had been compelled, however, to take into consideration the recent wage increases granted by certain nationalised industries and in particular that announced by the electricity supply industry on 10th February amounting to 4d per hour (following a similar increase 12 months previously) for all manual workers including electrical contracting operatives. The Area Boards of the Central Electricity Authority competed with the private electrical contractor in this field and in common with the majority of similar trades the demand for operatives considerably outstripped the supply. As a result operatives who had been trained by private electrical contractors and at considerable expense were attracted from their employ to the Area Boards. It was on that basis and that basis alone that the Association, after fully explaining the situation to the Ministry of Labour and seeking its guidance, decided to make the award.

British Export Prospects

British exporters were already outpriced in major export markets, declared Mr. Miles Beevor, managing director of Brush Group, Ltd., at a Press conference held at the group's headquarters in London on 27th February. Mr. Beevor, who has just returned from a 15,000 miles tour of Egypt, Ceylon, India and Pakistan, said that we could not afford to increase our prices still further, lose our trade and lose our prestige at the time when we most needed it. The remedy, he suggested, must lie in closer co-operation between management and labour and a livelier appreciation of exporters' difficulties by the Government. He had found intense competition from Continental, "Iron Curtain" and Japanese manufacturers of capital equipment. To achieve their ends they were prepared to enter the export markets at cut prices, even at below cost prices, and they received vigorous support from their Governments.

British equipment could still be sold, and was being sold, by good agents and good factory representatives, when the price was no more than 10 or 15 per cent above competitors' prices. But there was no hope at all of selling when the difference was as much as 30 to 40 per cent.

Damascus Fair

In view of the growing importance of British exports to the Middle East, the Federation of British Industries has announced that it is organising for the first time a United Kingdom pavilion at the forthcoming International Trade Fair at Damascus, which takes place from 1st to 30th September next. This project will be carried out by the Federation's subsidiary company, British Overseas Fairs, Ltd. It has the full support of the Board of Trade. The Fair offers a valuable opportunity for British exporters, particularly in the spheres of engineering and capital products and some kinds of consumer goods. The proposed pavilion at this year's fair will cover an area of about 20,000 sq ft, and the cost to exhibitors will be about 35s per sq ft. But this cost should be considerably reduced in future years if the pavilion remains *in situ*, and the first year's exhibitors would then be granted a specially reduced rate. In addition there will be some 20,000ft of outside space, where agricultural machinery and other large exhibits can be displayed.

Engineers' Wage Increase

Following further talks between the Engineering and Allied Employers' Federation and the Confederation of Shipbuilding and Engineering Unions it was announced last week that agreement had been reached on the unions' wage claim. Skilled engineering workers are to receive another 12s 6d a week, unskilled men another 9s 6d and intermediate grades an additional 11s. The increases date from Monday last. Some three million workers are affected and the cost will amount to about £80 million a year. A previous offer by the employers was rejected by the unions. The settlement raises the weekly wage for craftsmen from £7 15s 10d to £8 8s 4d, and for labourers from £6 12s 10d to £7 2s 4d.

Large Canadian Contracts

The British Aluminium Co.'s subsidiary, the Canadian British Aluminium Co., Ltd., is placing contracts in this country for electrical equipment to the value of over £2¼ million. A contract being placed with the British Thomson-Houston Co., Ltd., covers the supply of mercury arc pumpless steel tank rectifiers with associated transformers and switchgear, valued at over £1¾ million, while the English Electric Co., Ltd., is to supply transformers and switchgear to the value of about £500,000.

The equipment is for supplying electricity to furnaces for the electric smelting of aluminium. The new smelting plant is to be built and operated by the Canadian British Aluminium Co. at Baiecomeau, Quebec. This is a township which has grown up since 1936 as the result of the building there of a paper mill by the Quebec North Shore Paper Co., who are partners with the British Aluminium Co. in the new aluminium development. The contracts were obtained against keen overseas competition and, at a total installed capacity of 190,000 kW, the order is believed to be the largest yet placed in the United Kingdom for rectifier conversion plant.

Management Conferences

The first conference to be held in Britain on management accountancy, organised by the British Institute of Management, will be held in Bournemouth from 15th to 17th March. Three other conferences organised by the Institute are a Midlands management conference at Droitwich (from 23rd to 25th March), a north-western management conference at Southport (13th to 14th April), and a Scottish management conference at Gleneagles (20th to 22nd April). Programmes of these conferences can be obtained from the Institute, 8, Hill Street, London, W.1.

Electronic Computer Service

The General Electric Co., Ltd., has established a computer service group at its Wembley research laboratories. The purpose of the group is to provide an advisory service on mathematical problems relating to any aspect of the company's activities. A "Hollerith" electronic digital computer, Hec 2M, manufactured by the British Tabulating Machine Co., Ltd., has been installed.

Industrial Safety Training Centre

The Birmingham and District Industrial Safety Group, which has since 1953 operated an Industrial Safety Training Centre in premises which were the property of the Birmingham Corporation, has now acquired premises of its own within a short distance of the Birmingham City Centre and is at present adapting them for use as a new training centre. There will be a large machine room in which practical demonstrations and tuition can be given, a lecture and

Transformers leaving the Hayes Works of Crompton Parkinson, Ltd., for the Uganda Electricity Board

cinema room, and adequate open space on which it is hoped to give instruction and training in the handling of power driven industrial trucks, fork lift trucks, etc. Courses will be organised for supervisors and foremen, electrical installation and maintenance workers, for those engaged on lifting and slinging heavy objects, and other subjects where a comprehensive course of training may be expected to reduce the risk of injury to operators. It is anticipated that the new centre will open in April next and a special syllabus is at present being prepared for distribution to safety officers, works managers, personnel and welfare officers, etc., to acquaint them with the new programme. Copies will be available towards the end of March and will be supplied on application to the hon. secretary of the Group, S.A.F.E. House, 22, Summer Road, Acocks Green, Birmingham, 27.

Instrument Research Laboratory

Mervyn Instruments (the Mervyn Sound & Vision Co., Ltd.) announces that continued expansion has made it necessary further to increase the accommodation for its laboratory. The new premises, in contemporary style, will incorporate many novel ideas in design. They will use electric storage heating, and include provision for further future developments.

Industrial Art Bursaries Competition

The Royal Society of Arts has announced the names of the successful candidates in its Industrial Art Bursaries Competition in 1955. They include Mr. P. J. Collins (L.C.C. Central School of Arts and Crafts) in the domestic electrical appliances section, and Mr. K. G. Sadler (Birmingham College of Art and Crafts) in the electric light fittings section, both of whom receive a bursary of £150. They are both also awarded associate membership of the Society.

Rural Electrification in Uganda

For the extensive rural electrification programme being conducted by the Uganda Electricity Board, Crompton Parkinson, Ltd., have completed a substantial order worth £23,000 for the supply of small distribution transformers. Included in the consignments, part of which is shown in the accompanying picture leaving the Hayes Works, are some twenty-four 15 kVA single-phase 50 c/s 11 kV/250 V pole-mounting, pentagonal shaped, rural transformers and twelve 25 kVA three-phase pole-mounting transformers. These will be installed on transmission lines throughout Uganda to serve the electrification needs of farms. Other ground mounting outdoor distribution transformers of 100 kVA and 500 kVA outputs will supply power to outlying communities. These small pole-mounting transformers have been designed on the same principles as the larger distribution transformers; the tappings are so arranged about the magnetic centre of the winding as to reduce to a minimum the resultant out-of-balance forces in the event of some external short circuit. The larger units are fitted with conservators and silica-gel dehydrating breathers as plain breathers would have allowed insects easy access to the transformers.

British Plastics Year Book

The 1956 edition of the British Plastics Year Book (Iliffe & Sons, Ltd., price 30s, postage 1s 9d) has been revised and extended to 740 pages. As before, it is divided into nine sections of which three are devoted to classified lists of manufacturers and suppliers of materials, finishing products and equipment. A further section contains a comprehensive list of trade and proprietary names connected with the plastics industry, covering materials, as well as finishing products. Each trade name is followed by a definition of the product, the manufacturer concerned, and, where the manufacturer is overseas, the country of origin. A glossary of technical terms used in plastics is also included in this section.

In the names and addresses section are listed nearly 4,000 firms associated with plastics, grouped into countries. Names and positions of prominent people in the industry are given in the "Who's Who" section.

The annual review of plastics this year contains 184 pages. All relevant patents issued during 1955 are collected, abstracted and arranged in subject groups. Prefaces to each group give a brief review of the year. New plastics companies registered last year are listed; details provided include the official date of registration, address, activities, capital and directors. The general index gives quick reference to any product.

E.D.A. Public Speaking Competition

There will be at least eighteen competitors, two more than last year, in the 1956 national finals of the E.D.A. Public Speaking Competition, to be held at the E.L.M.A. Lighting Service Bureau, 2, Savoy Hill, London, W.C.2. This year's finals will be held on 25th April for the women (who have ten finalists) and on 26th April for the men (eight contestants).

The competition's premier awards, the Faraday Silver Challenge Shields, are held for one year by the Area Boards from which the winners come, the individual winners receiving replicas. The present holders of the women's shield are the North Western Electricity Board, while the South of Scotland Electricity Board holds the men's shield. Nine area contests have already been held and the winners are as follows:—

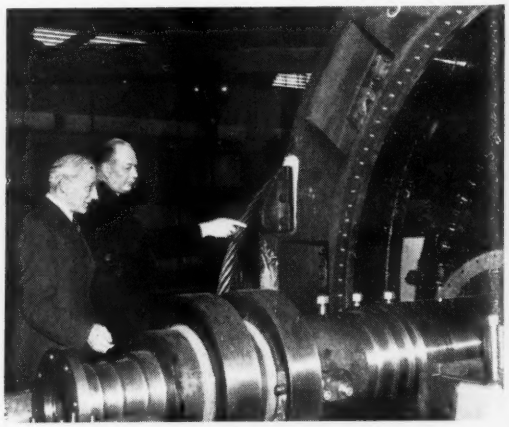
Women's Section. South Western: Mrs. D. V. Prescott (Bristol South District). Eastern: Miss Margaret Wilson (Huntingdon). Merseyside and North Wales: Miss Joan M. Williams (Llandudno). Yorkshire: Miss Audrey W. Milan (Doncaster District). Midlands: Miss P. W. Leith (Worcester).

Men's Section. South Western: Mr. K. H. James (Bath). Eastern: Mr. H. D. Stacey (Cambridge). Merseyside and North Wales: Mr. P. W. Blackwell (Chester). Yorkshire: Mr. F. R. Williams (Hull Sub-Area Commercial Department).

Royal Visit to Parsons

On 23rd February the Duke of Gloucester, accompanied by the Duke of Northumberland, visited the Heaton works of C. A. Parsons & Co., Ltd.

The Duke of Gloucester and Mr. F. W. Gardner (director and general manager) at the Heaton works of C. A. Parsons & Co., Ltd.



The Dukes were received by Mr. F. W. Gardner, director and general manager of the company, who escorted them round the works. The accompanying picture shows the Duke of Gloucester inspecting the alternator for a 100 MW turbo-generator.

"Telex" Expansion

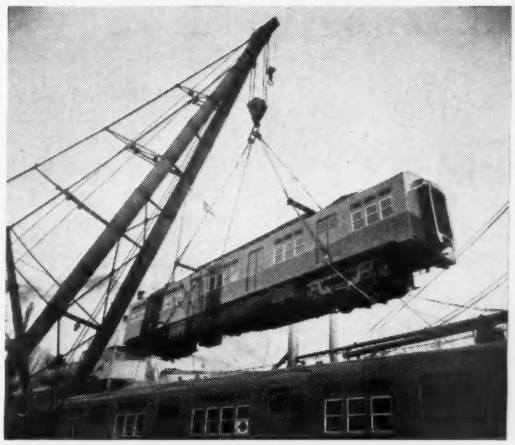
The Post Office installed 855 new "Telex" lines last year, representing an increase of 50 per cent in the size of the network. This year the Post Office aims to provide 1,100 new subscribers' lines.

Domestic Appliances in Colour

At a private Press view held in London last week, Mr. K. Wood, managing director of the Kenwood Manufacturing Co., Ltd., showed a number of food mixers with different colour combinations, and asked the audience to select the four basic colours which the company intends to manufacture initially. There will be no price increase for the new colour range, which will be available to present users as well as to future buyers. Housewives now owning a standard model "Kenwood Chef," "Kenmix 55" or "Steam-O-Matic" iron may take these appliances to their local dealer, who for an inclusive sum will have them converted to the colour of their choice. If any further variation is required, the plastic fittings may be exchanged. The launching of this colour range will result in intensification of Kenwood's after-sales service organisation. This will include twice-yearly visits to each Kenwood user's home by a qualified technical engineer, who will maintain and service the mixer.

Textile Mill Space Heating

Work almost came to a standstill in the weaving sheds of George Ramsbottom, Ltd., when the gas boilers burnt out for lack of water during the cold spell. To keep production going the company, situated in Ramsbottom, Lancs, ordered electrical space heating equipment for the mill. It was delivered and installed, and weaving was once again in full progress within one week of the breakdown. The heaters chosen were 2¼ kW "Nightstor Majors" which were supplied through the Blackburn Branch of the General Electric Co., Ltd. A total of 110 heaters were ordered, and the North Western Electricity Board brought a special 250 kW supply to the works to carry the load, which occurs during off-peak night periods at a cheap tariff rate. Additional equipment supplied by the G.E.C. to complete the installation included switchgear, distribution boards, cable and accessories.



Electric train coaches, part of a Metropolitan-Vickers contract, being loaded on board ship for Brazil

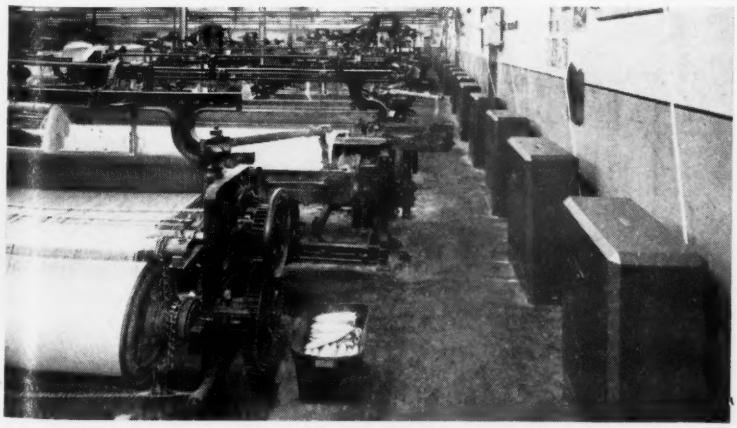
Spin Dryer Demonstrations

A series of trade demonstrations of an electric spin dryer is being held in the north by Morphy-Richards, Ltd. Demonstrations have already been held at the premises of Hirst, Ibbetson & Taylor, Ltd., Salford, and F. K. Smith, Ltd., Liverpool. On 13th March a demonstration will be given at the Albion Electric Stores, Ltd., Piccadilly, Bradford, and on 14th and 15th March at the last mentioned company's Albion Street, Leeds, premises. Retailers in these areas are being invited to the demonstrations.

Railway Equipment for Brazil

The accompanying picture shows electric train coaches being loaded aboard s.s. *Parima* at Liverpool Docks *en route* for Brazil. The coaches shown comprise the first shipment of equipment on a £7,000,000 contract awarded to the Metropolitan-Vickers Electrical Co., Ltd., by the Central Railway of Brazil in early 1954. The contract, obtained in the face of severe foreign competition, was for the supply of two hundred complete railway coaches to be built and equipped in this country and a hundred sets of electrical equipment for fitting to coaches built in Brazil. These will provide 100 new three-coach trains for the Rio de Janeiro suburban lines.

A number of the 110 G.E.C. "Nightstor" heaters which have been installed in the weaving sheds of George Ramsbottom, Ltd.



Railway Electrification Film

A film show was given recently by British Insulated Callender's Construction Co., Ltd., to an audience of students from Northampton and Woolwich Polytechnics. The films dealt with railway electrification overhead system work with which the company has been concerned since 1914. The construction of the electrified services between Liverpool Street-Shenfield, Manchester-Sheffield and Wath were shown in detail, as well as the present activities on the Shenfield-Chelmsford-Southend route. Particular interest was shown in the film dealing with the mechanisation of foundation work, mechanisation achieved by the use of a special construction train consisting of a mechanical auger, a mast erection unit and a concreting unit.

Trade Announcements

The **Walter Group of Companies** has decided, in order to provide closer contact between manufacture, service and despatch, to centralise all its various sales divisions in its main sales offices at its factory at Garth Road, Lower Morden, Surrey, to which address all correspondence to companies in the group should now be addressed.

Remington Rand, Ltd., announces that its Dundee office is now at 22, King Street, Dundee (telephone: Dundee 3875). Mr. J. P. Farrer is in charge.

The Glasgow branch office and stores of **British Insulated Callender's Cables, Ltd.**, is now at 109, Douglas Street, Glasgow, C.2 (telephone: Central 2151-4).

GENERATION AND DEVELOPMENT

Castleford Service Centre

The new service centre which, as recently reported, has been opened by the Yorkshire Electricity Board at the corner of Carlton Street and Station Road, Castleford, is now the main service centre in the Castleford district and when the offices on the first and second floors are occupied the building will constitute the district commercial administration centre.

The cash counter and inquiry desk are in the main part of the service centre and an archway leads through to a combined display and demonstration room. This room contains a false ceiling for the display of domestic lighting fittings at the normal height from the ground and a demonstration kitchen on a raised platform. The lighting generally is on conventional lines but there is a high level of illumination throughout. Immediately opposite the main entrance is a special display alcove with coloured lighting for showing selected appliances. Heating is by standard thermal storage units taking supplies at off-peak periods. Two of the heaters have been concealed in a decorative display feature which surrounds the pillar seen in the accompanying photograph.

Planning and supervision of the work have been carried out by the Board's engineering and commercial staff, the conversion of the old building into up-to-date showrooms presenting many problems. The adaptation is being done in two stages, the first of which, covering the service centre, has now been completed. The part of the ground floor not occupied by the service centre will have workshops for radio, television, and minor appliance repairs and work on this and the adaptation of the upper floors into offices is proceeding.

Transmission Line

The Tyne Improvement Commission has sanctioned the construction of a 132 kV transmission line across the Tyne between Stella North and Stella South power stations. There will be six conductors and two earth wires, suspended on towers 1,119ft apart. The minimum clearance will be 55ft above high water.

Hire Schemes Suspended

The North Eastern Electricity Board and the Northern Gas Board have informed local authorities in their areas that they have stopped hiring electrical and gas appliances. The Boards state that this step has been taken owing to restrictions on capital expenditure. In future local authorities will have to purchase appliances for housing schemes.

Kariba Project

The Salisbury correspondent of *The Times* reports that a revised Kariba project prepared by the consulting engineers, after discussions with a firm of accountants, the Hydro-Electric Board, and the Government, now provides for power first becoming available from Kariba early in 1960, compared with July, 1961, the date given by the French consultants. The construction programme provides for the first power to be transmitted to the Copperbelt in 1960, with Southern Rhodesia obtaining its first supply during 1961.

A contract valued at about £3½ million has been awarded to Richard Costain (Southern Rhodesia), Ltd., for the building of a township on the south bank of the Zambesi River to house workers on the Kariba scheme. Work is due to start immediately and the contract is scheduled for completion towards the end of 1957. A population of about 10,000 is envisaged in the new township and the contract calls for the building of houses, schools, hospital, power station, roads, etc. The contract, which was obtained in face of competition from other countries, has been let by the Federal Hydro-Electric Board of Rhodesia and Nyasaland. The consulting engineers are Gibb, Coyne, Sogei (Kariba) (Pvt.), Ltd., of Salisbury, Southern Rhodesia.

Power Shortage in Switzerland

The Swiss Government has banned the use of all electric heating appliances until further notice and ordered hospitals and factories to reduce their hot water consumption as emergency measures to save dangerously low power reserves. Switzerland has only enough hydro-electric power to last about two weeks at the present unusually high rate of consumption. —*Reuter.*

Street Lighting

DEWSBURY Town Council has obtained sanction to borrow £10,792 for converting the lighting of all main roads and bus routes from tungsten to sodium. There will be a saving of £1,500 a year in the town's electricity bill although under the new system the light output will be doubled for the main roads and trebled for other bus routes. Steady progress is being made in the change-over from gas to electricity in other streets; the cost of installation will be recovered in four years through lower maintenance costs.

The main streets of Ross, Herefordshire, may soon be lit by sodium lamps. The capital cost is estimated at £5,000 of which the Ministry of Transport will pay half.

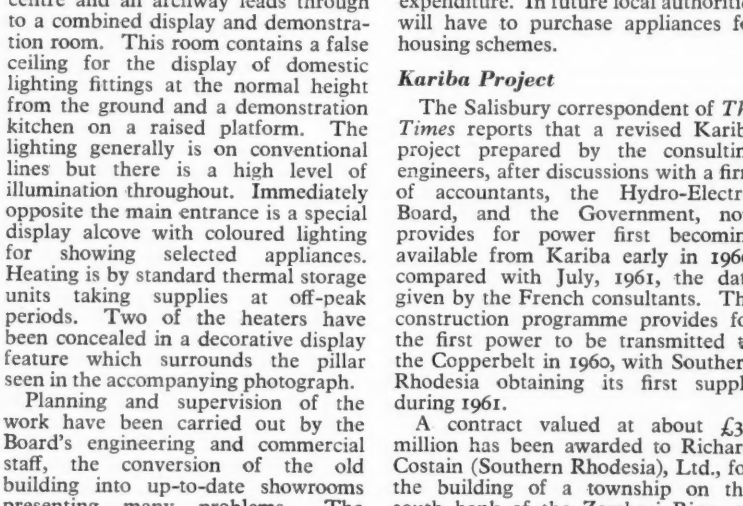
GUILDFORD Works Committee recommends approval of a scheme submitted by the borough surveyor for additional lighting in the Park Barn area, including the present housing development, at an estimated cost of £4,300.

The borough engineer of TOTTENHAM has been authorised to invite tenders for the fourth stage of the scheme for the conversion of existing gas public street lighting to electric lighting.

The DENBY DALE U.D.C. has accepted an £8,398 scheme for the conversion of street lamps to the mercury vapour type.

BLACKPOOL Highways Committee has received the consent of the Ministry of Housing and Local Government to the borrowing of £77,110 for improved street lighting in the town centre (£14,710) and the replacement of further gas street lighting by electricity (£62,400).

SUNDERLAND Corporation has received £3,947 loan sanction for the conversion of street lighting on various roads from gas to electricity.



A section of the new Castleford Service Centre

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

Monday, 12th March

BIRMINGHAM. — Imperial Hotel, 6 p.m. I.E.E. South Midland Supply & Utilisation Group. "Timing the Operation of Control Gear associated with Rotating Equipment," by C. Cuthbert and D. A. Picken and "The Dynamic Braking of Induction Motors," by Dr. D. Harrison.

BRISTOL.—Lecture Hall, University Engineering Laboratories, 6 p.m. I.E.E. Western Centre. "The Application of Symmetrical Components to the Measurement of Phase Difference in Single Phase Circuits," by R. L. Russell and "The Design of Semi-Conductor Wattmeters for Power-Frequency and Audio-Frequency Applications," by Prof. H. E. M. Barlow.

GLASGOW.—39, Elmbank Crescent, 7 p.m. British Institution of Radio Engineers, Scottish Section. "Principles of the Transistor and Some Important Applications," by M. H. N. Potok.

LONDON.—Savoy Place, W.C.2, 6.30 p.m. I.E.E. London Graduates' & Students' Section. "Railway Modernisation," by General Sir Brian Robertson. (Joint meeting with the Association of London Graduates and Students of the Institution of Civil Engineers and the London Graduates' Section of the Institution of Mechanical Engineers.)

St. Ermin's Hotel, Caxton Street, S.W.1, 7 p.m. A.S.E.E. Central London Branch. "Electric Pumps."

NEWCASTLE-UPON-TYNE.—At the Literary & Philosophical Society, 6.15 p.m. I.E.E. North-Eastern Centre. "Circuit Breaking and Power System Problems," by C. H. W. Lackey and A. T. Crawford.

SHEFFIELD. — The University, Western Bank, 6.30 p.m. I.E.S. Sheffield Centre. "Preparing for the Future," by A. G. Penny.

WEMBLEY PARK.—Century Hotel, Forty Avenue, 8.15 p.m. A.S.E.E. North-West London Branch. Branch lecturettes.

Tuesday, 13th March

BELFAST.—Queen's University, 6.30 p.m. I.E.E. Northern Ireland Centre. "The Standardisation of Retail Electricity Tariffs," by A. O. Johnson and N. F. Marsh.

BRISTOL.—Grand Hotel, Broad Street, 7.30 p.m. Institution of Engineering Inspection, South-Western Branch. "Radar."

CAMBRIDGE.—Cavendish Laboratory, 8.15 p.m. I.E.E. Cambridge Radio & Telecommunication Group. "Television Methods in Astronomy," by Dr. P. G. Fellgett.

CHELMSFORD. — Public Library, 7 p.m. I.E.E. London Graduates' & Students' Section, district meeting. "Development of Electric Traction for Railways," by E. C. Carlick.

FARSLEY.—I.E.E. North Midland Graduates' & Students' Section. Visit to David Brown & Sons, Ltd., at 7 p.m.

LEEDS.—1, Whitehall Road, 6.30 p.m. I.E.E. North Midland Utilisation Group. Discussion on "The Thirteenth Edition of the Regulations for the Electrical Equipment of Buildings," opened by Forbes Jackson.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement & Control Section. "The Dual Input Describing Function and its Use in the Analysis of Non-Linear Feedback Systems," by Dr. J. C. West, Dr. J. L. Douce and Dr. R. K. Livesley.

2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. "Illumination for Colour Matching," by E. E. Miles and D. C. Peach.

MANCHESTER. — Midland Hotel, 6.45 for 7.15 p.m. I.E.E. North-Western Centre. Annual dinner.

Wednesday, 14th March

BATH.—Technical College. I.E.E. Bristol Graduates' & Students' Section. "Induction Regulators," by F. Beach.

BIRMINGHAM.—James Watt Institute, 6.30 p.m. I.E.E. South Midland Graduates' & Students' Section. "Design and Use of Vehicle Lighting Equipment," by G. E. Charlesworth.

Chamber of Commerce, New Street, 7.15 p.m. A.S.E.E. Birmingham Branch. "Electric Furnaces," by Mr. May.

Exchange & Engineering Centre, Stephenson Place, 6.30 p.m. Institute of Metal Finishing, Organic Finishing Group. "Problems of Communication between Science and Industry, with particular reference to the Role of the Technical Press," by J. Hooper.

FARNBOROUGH.—R.A.E. Technical College, 7.30 p.m. I.E.E. Southern Centre. "Germanium and Silicon Power Rectifiers," by T. H. Kinman, G. A. Carrick, R. G. Hibberd and A. J. Blundell.

LIVERPOOL.—Chamber of Commerce, 1, Old Hall Street, 7 p.m. British Institution of Radio Engineers, Merseyside Section. "Underwater Television," by D. R. Coleman and D. Allanson.

LONDON.—I.E.E. Education Discussion Circle. Visit to the Science Museum, South Kensington, at 6.15 p.m., followed by a talk on "The Museum's Electrical Collections," by G. R. M. Garratt.

St. Bride Institute, Bride Lane, E.C.4. Institution of Engineers-in-Charge. "Television as an aid to Productivity," by J. E. H. Brace.

MANCHESTER. — Engineers' Club, Albert Square, 6.45 p.m. I.E.E. North-Western Radio & Telecommunication Group. "Frequency-Modulation Radar for use in the Mercantile Marine," by D. N. Keep.

NEWCASTLE-UPON-TYNE. — Neville Hall, Westgate Road, 6 p.m. British Institution of Radio Engineers, North-Eastern Section. "Band III Television Aerial Design," by A. P. Hale.

NORTHAMPTON.—College of Technology, 7.15 p.m. Northampton & District Electrical Association. Members' night.

NOTTINGHAM.—Victoria Station Hotel, 6.30 for 7 p.m. Incorporated Plant Engineers, East Midlands Branch. Annual dinner.

OXFORD.—S.E.B., 37, George Street, 7 p.m. I.E.E. district meeting. "New Tools in Industry—Ultrasonics," by W. Owen Roberts.

OXTED. — I.E.E. London Graduates' & Students' Section. Visit to Nevelin Electric Co., Ltd. (Mercury Arc Rectifiers) at 2.30 p.m.

PRESTON. — N.W.E.B. Demonstration Theatre, Friargate, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. "The Electrification of the Manchester-Sheffield-Wath Lines, Eastern and London Midland Regions, British Railways," by J. A. Broughall and K. J. Cook.

RUGBY.—College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Graduates' & Students' Section. "High Voltage Research," by D. Binns.

SHEFFIELD.—City Hall, 7.30 p.m. I.E.E. Sheffield Sub-Centre. Faraday Lecture: "Coal Mining Electrically," by B. L. Metcalf.

The University, St. George's Square, 7 p.m. Society of Instrument Technology, South Yorkshire Section. Annual general meeting, followed by Chairman's address: "A University Course in Instrumentation," by A. Pollard.

STAFFORD.—I.E.E. North Staffs. Graduates' & Students' Section. "Electricity in Ships," by G. Jackson, at 7.15 p.m.

WOLVERHAMPTON. — Wolverhampton & Staffordshire Technical College, Wulfruna Street, 7.15 p.m. British Institution of Radio Engineers, West Midlands Section. "The Application of Transistors to Radio Rectification," by E. Wolfendale.

YORK.—Shambles Café, 7.15 p.m. A.S.E.E. York Branch. Films.

Thursday, 15th March

CHELMSFORD.—Crompton's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Castings and the Engineer," by H. W. Keeble.

DUBLIN.—Physical Laboratory, Trinity College, 6 p.m. I.E.E. Irish Branch. "Electrical Protection—a Résumé of the Methods used in a Modern Power Station," by C. V. O'Donnell.

GLASGOW. — 39, Elmbank Crescent, 7.30 p.m. Institution of Production Engineers, Scottish Region, Glasgow Section. "Computer-Controlled Machine Tools," by D. T. N. Williamson.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilisation Section. "Underground Lighting in Coal Mines," by Dr. C. D. J. Statham.

Dorchester Hotel, W.1. Electrical Wholesalers' Federation. Annual general meeting, followed in evening (6.30 for 7 p.m.) by annual dinner.

Caxton Hall, S.W.1, 2.30 p.m. Diesel Engineers' & Users' Association. "Maintenance of Road Transport Engines with particular reference to Smoke Emission."

2, Savoy Hill, W.C.2, 6 p.m. Royal Statistical Society, Study Section. "How the Statistician is Helped by Electronic Computers," by M. J. R. Healy, Dr. H. W. Durant and Dr. S. J. Prais.

Friday, 16th March

LONDON.—Café Royal, 7 for 7.30 p.m. I.E.E. Radio and Measurement Sections. Joint dinner-dance.

Connaught Rooms, W.C.2, 6.30 for 7 p.m. Batti-Wallahs' Society. Jubilee ladies' night.

Connaught Rooms, W.C.2, 12.30 p.m. British Refrigeration Association. Luncheon.

Savoy Hotel, W.C.2. Institution of Works Managers, London Branch. Annual dinner and dance.

Pepys House, 14, Rochester Row, 7 p.m. Junior Institution of Engineers. "Notes on the Exploitation of Water Power," by W. H. Bailey.

LOUGHBOROUGH.—The College, 7.15 p.m. Institute of Fuel, East Midland Section. "Nuclear Power Stations," by H. S. Arms. (Joint meeting with the Loughborough College Scientific Society.)

NEWCASTLE-UPON-TYNE.—City Hall, 7 p.m. I.E.E. North-Eastern Centre. Faraday Lecture: "Coal Mining Electrically," by B. L. Metcalf.

PORTSMOUTH.—College of Technology Extension, Anglesea Road, 6.30 p.m. I.E.E. Southern Graduates' & Students' Section. "Gas Turbines." (Joint meeting with the Graduates' Section of the Institution of Mechanical Engineers.)

Saturday, 17th March

LONDON.—I.E.E. London Graduates' & Students' Section. Visit to St. Bartholomew's Hospital, E.C.1 (Radiotherapy), at 10 a.m.

Institute of Metal Finishing

The annual conference of the Institute of Metal Finishing will be held from 17th to 21st April next at Norbreck Hydro, Blackpool. Particulars of the conference and forms of reservation can be obtained from the conference secretary, 32, Great Ormond Street, London, W.C.1.

International Motor Shows

The International Commercial Motor Transport Show will be held from 21st to 29th September and the International Motor Show from 17th to 27th October. Both will be held at Earls Court, London.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia.—20th March. Commonwealth of Australia, Department of Civil Aviation. Fuses and fuse parts for radio and radar equipment. (E.S.B. 4899/56. Ten/18181.)*

22nd March. Snowy Mountains Hydro-Electric Authority. Special systems cable for telephone and voice-frequency signalling. (E.S.B. 4988/56. Ten/18182.)*

9th April. Department of Public Works, New South Wales. Electrically driven sewage and sludge pumping plant. (E.S.B. 5989/56. Ten/18172.)*

2nd May. State Electricity Commission of Queensland. Four 11 kV outdoor circuit-breakers. (E.S.B. 4999/56. Ten/18215.)*

4th May. Brisbane City Council. Twelve 33 kV oil circuit-breakers. (E.S.B. 4721/56. Ten/18151.)*

Burma.—17th March. Union Purchase Board. 9,000 electric lamps. (E.S.B. 5221/56. Ten/18226.)*

Canada.—15th March. Manitoba Hydro-Electric Board. Metal-clad switchgear. (E.S.B. 5129/56. Ten/18228.)*

Cornwall.—17th March. County Council. Electrical installation in the new county secondary school, Hayle. (See this issue.)

Egypt.—2nd May. Ministry of Public Works, Cairo Electricity and Gas Administration. Three transformer substations at Helmieh, Abbassieh and Azhar. (E.S.B. 4887/56. Ten/18175.)*

Greece.—27th March. Ministry of Communications and Public Works. Radio communication relay links. (E.S.B. 4435/56. Ten/18093.)*

India.—29th March. Director General of Supplies and Disposals. Underground telephone cable. (E.S.B. 5055/56. Ten/18206.)* Three passenger lifts in All Indian Radio offices. (E.S.B. 5056/56. Ten/18208.)*

31st March. Government of Madras Electricity Department. Fire detection equipment for Periyar power station transformer yard. (E.S.B. 4429/56. Ten/18078.)*

15th April. Department of Mechanical Engineering, Engineering College, Guindy, Madras. 500 kW turbo-alternator with condenser. (E.S.B. 4966/56. Ten/18177.)*

Iraq.—31st March. Ministry of Development. Electrical plant and cables for Sersang, Zawita, Shaqlawa and Haji Omran. (E.S.B. 4108/56. Ten/18116.)*

7th April. Woollen Textile Co., Ltd., Baghdad. Electrical equipment, etc., for the new textile factory. (E.S.B. 5092/56. Ten/18210.)*

King's Lynn.—14th March. Borough Council. Electric lamps and sundries for the year ending 31st March, 1957. H. G. Ridler, borough engineer, Clifton House, 17, Queen Street.

Llandudno.—20th March. U.D.C. Substitution of electric for gas street lighting. Surveyor, Town Hall.

London.—26th March. Crown Agents. Electrical equipment including cables, aluminium alloy and copper wire, 22 kV cubicle-type control panels, and watt-hour heaters for Mauritius. (See this issue.)

20th April. India Store Department. Aircraft and other cables. (See this issue.)

Manchester.—19th March. Education Committee. Four 15 kVA synchronous machine sets for Municipal College of Technology. (See this issue.)

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1. (Chancery 4411; extension 769).

New Zealand.—24th April. General Post Office. Insulated cable. (E.S.B. 5025/56. Ten/18212.)*

Nottingham.—16th April. City Water Department. Centrifugal pumps, electric motors, switchgear, alternator, etc., for Halam pumping station, Southwell. Mr. B. W. Davies, engineer and general manager, Water Department, Castle Boulevard.

Pakistan.—31st March. Posts and Telegraphs Department. Twelve speech plus Duplex telegraph systems. (E.S.B. 4964/56. Ten/18214.)*

Portuguese West Africa.—16th April. Provincial Section of the Treasury of Sao Tome and Principe. Automatic telephone network; automatic telephone exchange for 500 telephones. (E.S.B. 4593-4/56. Ten/18167-8.)*

South Africa.—21st March. Stores Department, South African Railways. Cables. (E.S.B. 4821-2/56. Ten/18135-6.)* 28th March. Miniature circuit-breakers. (E.S.B. 5029/56. Ten/18203.)* 5th April. Distribution wire. (E.S.B. 5215/56. Ten/18202.)*

Southern Rhodesia.—14th March. Electricity Supply Commission, Salisbury. 88 kV voltage transformers. (E.S.B. 5263/56. Ten/18235.)*

United States.—19th March. Public Utility District No. 1, Benton County, Kennewick, Washington. 15,000 kVA unit substation. (E.S.B. 5133/56. Ten/18237.)*

Ware.—14th March. U.D.C. Street lighting equipment. Mr. A. G. Davenport, surveyor, The Priory.

ORDERS PLACED

Lancashire.—County Council Education Committee. Electrical installation at the Horwich County Secondary School (£2,680). —Cowap & Son.

Reading.—Corporation Housing Committee. Electrical installations in 128 houses on the Whitley housing estate (£2,016).—Southern Electricity Board.

Rochdale.—Corporation Education Committee. Electrical installation at the Castlemere School (£1,465).—Bottomley, Denne & Kershaw.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Barking.—Houses (244), Thames View Housing Estate; E. R. Farr, town clerk, Town Hall.

Bebington.—Flats (48) at Town Lane, Lower Bebington; Lloyd & Cross, Ltd, Argyle Street, Birkenhead.

Birkenhead.—Office block; Cammell Laird & Co., Ltd., New Chester Road.

Bognor Regis.—Houses (84), the South Bersted Estate; R. W. J. Hill, clerk, Town Hall.

Brookwood (Surrey).—Male staff hostel (£34,700) for South West Metropolitan Regional Hospital Board; architect to the Board, 76, Wimpole Street, London, W.1.

Cardiff.—Works and offices, Wood Street; Western Mail & Echo, Ltd., 102-5, St. Mary Street.

Chesterfield.—Houses (46), Old Whittington No. 1 Housing Site; borough architect.

Colchester.—Crematorium; Duncan, Clark & Beckett, architects, 7, West Stockwell Street.

Dudley.—Houses (158), Saltwells estate; Hy. Boot & Sons, Ltd, Eccleshall Road South, Sheffield.

Durham. — Carpet making factory, (£1,000,000); Hugh Mackay & Co., Ltd.

Eastbourne.—College hall and dining block, Darley Road, for Eastbourne Training College; borough surveyor, 4, Saffrons Road.

Eastleigh.—Office building, Derby Road and High Street; W. E. Chivers & Sons, Ltd., builders, Joinery Works, Devizes.

Frimley.—Factory at Manor Road, Frimley Green (£500,000); Johnson's, wax polish manufacturers, West Drayton, Mdx.

Gateshead.—Houses (208), Lobley Hill Estate; William Leech Ltd., builders, 2, Clayton Street, Newcastle-on-Tyne, 1.

Grimsby.—Houses (280), Yarborough Road, and 400 proposed on the Scarthoe Estate; J. V. Oldfield, borough surveyor, Municipal Offices, Town Hall Square.

Hamilton.—Flats (52), Burnbank Road development site; burgh surveyor, Cadzow Street.

Heanor.—Office block; Vic Hallam, Ltd., builders, Valley Works, Langley Mill.

Huntingdonshire. — Secondary modern school, St. Ives, and county primary school at Orton; S. Holloway, county architect, County Buildings, Huntingdon.

Ilford.—Synagogue, hall and classrooms, Beehive Lane; Norman Green, architect, 12, Adeline Place, Bedford Square, W.C.1.

Flats, (72), Ilford Lane; Hammond & Miles, Ltd., builders, Scrafton Road Works.

Leeds.—Dwellings (202), Belle Isle Estate; Hall & Dudley, Ltd, 221, Woodhouse Lane.

Leek.—Modernisation of St. Edward's Hospital, Cheddleton (£150,000) for Birmingham Regional Hospital Board; Offices of the Board, 10, Augustus Road, Edgbaston, Birmingham, 15.

Leicester.—Flats (264), Mowmacre Hill Estate (£394,190); and bungalows (65) for old people at Braunstone; city architect.

London.—Home for the aged at Upper Tulse Hill and Roupell Road, Lambeth (£109,824); Dr. J. L. Martin, L.C.C. Architects' Department, County Hall, Westminster Bridge, S.E.1.

Office block, 50, Mark Lane; L. W. Hammerson & Partners Ltd., Quadrex House, Park Lane, W.1.

Showrooms and offices, 187-203, Shaftesbury Avenue; Trollope & Colls, Ltd., builders, 41-44, Gt. Queen Street, W.C.2.

Malling (Kent).—Houses (104), Ham Hill, Snodland; R.D.C. surveyor, Council Offices, West Malling.

Milford Haven.—Houses (77), Gellyswick Estate; U.D.C. surveyor.

Peterborough.—Extension to Technical College (£70,000); Portess & Richardson, architects, Lloyds Bank Chambers.

Romford.—Factory and offices; Henry Ronson, Ltd., 123, Arlington Avenue, N.1.

St. Albans.—Houses (64), Sheephouse Farm Estate, London Colney; R.D.C. architect, 43, Upper Lattimore Road.

St. Leonards-on-Sea.—Factory, Theaklen Drive; Lincoln Pratt, Ltd., builders, 28, Nightingale Road, E.11.

Sheffield.—Flats (974), Park Hill redevelopment area; J. L. Womersley, city architect, Town Hall, 1.

Wallsend.—Extensions to Civic Hall (£21,000); Robert Burke, architect, Lambton House, Lambton Road, Newcastle-on-Tyne.

Block of offices (£30,000); Victor Products (Wallsend), Ltd., Church Bank.

Walsall.—Houses (124) at Mossley Estate for B.C.; F. A. & H. Taylor, Ltd, Croxtall Rd, Bloxwich.